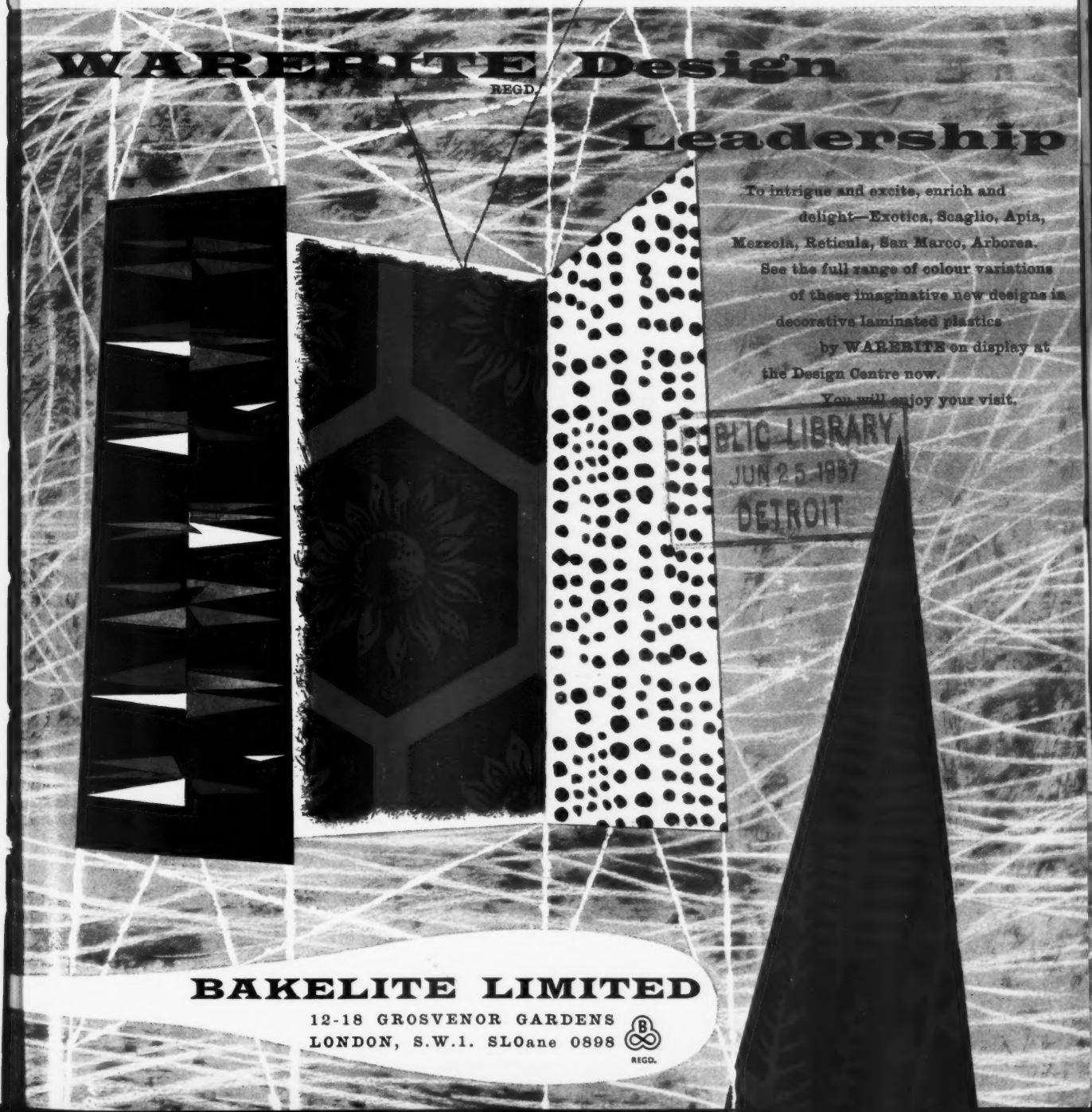
Plastics

DEALING WITH THE MANUFACTURE, USES AND POTENTIALITIES OF PLASTIC MATERIALS


WARERITE REGD. Design Leadership
To intrigue and excite, enrich and delight—Exotica, Scaglio, Apia, Mezzola, Reticula, San Marco, Arborea. See the full range of colour variations of these imaginative new designs in decorative laminated plastics by WARERITE on display at the Design Centre now. You will enjoy your visit.
BAKELITE LIMITED
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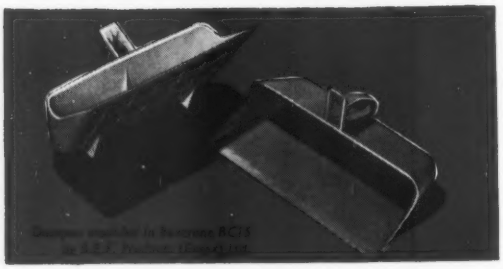
tough enough to take the rough—

as well as the smooth of everyday household routine. Bextrene BC 15 toughened polystyrene moulding powder finds an ideal use in this smart, hard-wearing domestic utensil. Bextrene BC 15 is outstandingly tough, moulds well and gives a finish to please the exacting housewife. For industrial mouldings, too, this high-duty material is in great demand.



BEXTRENE | BC15

TOUGHENED POLYSTYRENE MOULDING POWDER

Full technical details on request.

BX PLASTICS LTD. (A SUBSIDIARY OF THE BRITISH XYLONITE CO. LTD.)
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TECHNOLOGY DEPT.

Greetings to our overseas visitors! You will have come from near and far to see the British Plastics Exhibition at Olympia, this year a more important event than ever and for the first time international in scope. We, of the B.I.P. Group, join with the British Plastics Industry in bidding you welcome, in assuring you that we shall do everything possible to make yours an enjoyable as well as an interesting and profitable visit . . . . .

Let's meet at Olympia...

B.I.P. CHEMICALS LTD.

A comprehensive display of end products made from Beetle moulding powders or incorporating Beetle resins. Special displays of polyester/glass fibre mouldings and of Melmex melamine tableware.

STAND No. K.4

THE STREETLY MANUFACTURING CO. LTD.

Trade mouldings, large and small, in a wide variety of thermosetting and thermoplastic material.
Streetly Melmex melamine ware for institutional and industrial catering.

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B.I.P. TOOLS LTD.

An outstanding display of moulds for the plastics industry.
These exhibits are of the highest standard of craftsmanship and the Company's products are exported to many countries.

STAND No. K.14

B.I.P. ENGINEERING LTD.

BIPEL auto-control presses and pelleters. Basic and special types of presses will be shown, all incorporating either automatic or auto-control of the moulding cycle.

STAND No. H.9

B.I.P. has assembled exhibits of great technical interest displayed on four separate stands, each of outstanding importance in their sections and covering materials, press plant, toolmaking and trade-moulding. Directors, Sales and Technical Staff will be there to greet you, to discuss your problems, exchange ideas and to suggest how the combined resources of the Group can best serve you—back home, in your own country.

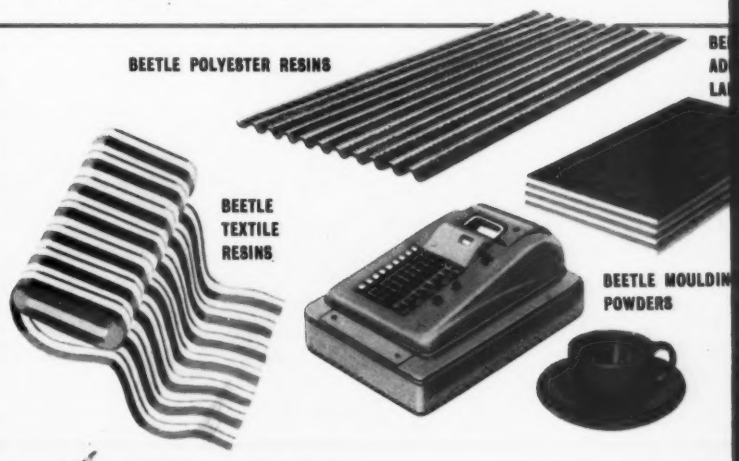
B.I.P. is a unique Group of Companies, for the scope of its manufacturing inte
in the plastics industry. These inter-related activities must be of special signif
to obtain from a single source the finest materials, press plant and tools availa
important—unrivalled service facilities, when you *need them, on the spot . . .*

only BIP *can offer this compl*

Nearly one-third of the Group's turnover derives from overseas sales. Your goodwill, therefore, is not only valued very greatly but B.I.P. endeavours to de supplying products of consistently high quality; by efficient representation in y and by special technical services available on call from our own factories. Tell us your problems and let us help find the answers . . . . .

MATERIALS

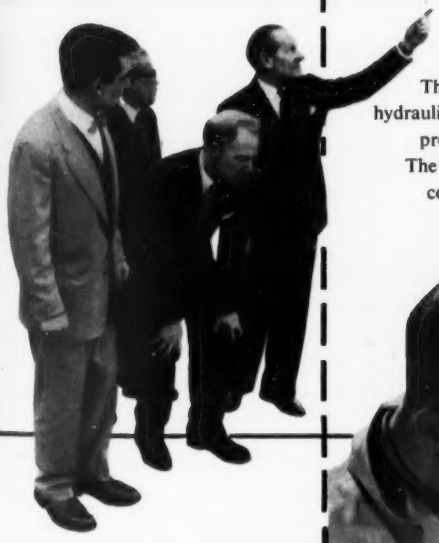
B.I.P. Chemicals Ltd. makes the highest quality u/f and m/f moulding powders and industrial resins. Of special interest are Beetle polyester resins, Beetle mineral-filled and Melmex moulding powders; and the most advanced Beetle coating resins.



BEETLE POLYESTER RESINS

BEETLE TEXTILE RESINS

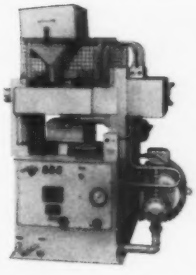
BEETLE MOULDIN POWDERS



PRESS PLANT

The BIPEL system of auto-control hydraulic moulding is designed for maximum productivity, quality and economy. The wide range of auto-control presses covers practically all compression moulding requirements.

BIPEL AUTO-CONTROL



BIPEL MULTI-PUNCH PELLETER

MOULD MAKING

B.I.P. Tools Ltd. is the foremost plastics mouldmaking company in Britain. It specialises in producing moulds in which the highest standard of craftsmanship is a prime requirement.

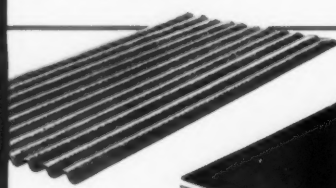
TRADE MOULDING

The modern moulding shops at Streetly are equipped for both compression and injection moulding, large and small machines of both types offering unusual versatility. Mass production of quality mouldings is the Streetly policy.

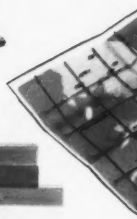
, for the scope of its manufacturing interests is without parallel
lated activities must be of special significance to you, for they enable you
st materials, press plant and tools available and—equally
, when you need them, on the spot . . . . .

er this complete service o

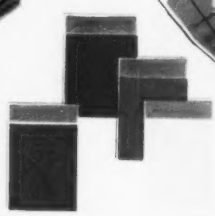
er derives from overseas sales. Your
very greatly but B.I.P. endeavours to deserve it, by
quality; by efficient representation in your country;
ble on call from our own factories.
find the answers . . . . .



BEETLE ADHESIVES AND LAMINATING RESINS



BEETLE MOULDING POWDERS



BEETLE COATING RESINS

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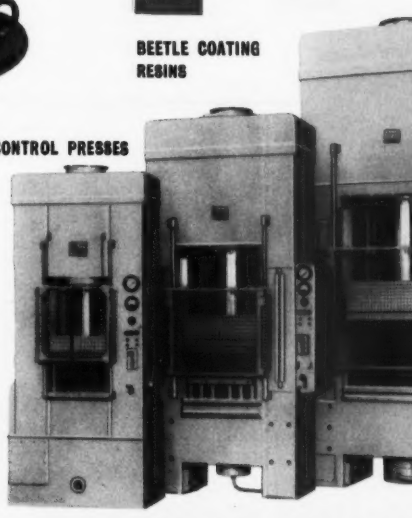
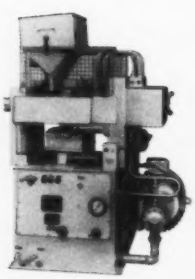
BIPEL AUTO-CONTROL PRESSES





BIPEL MULTI-PUNCH PELLETER

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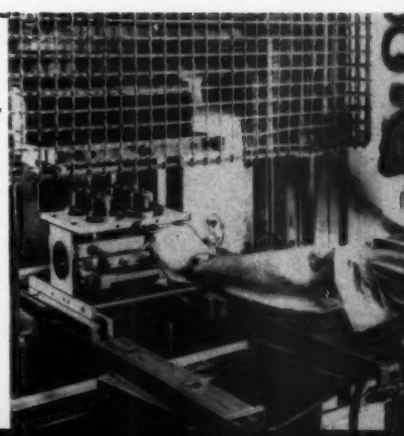

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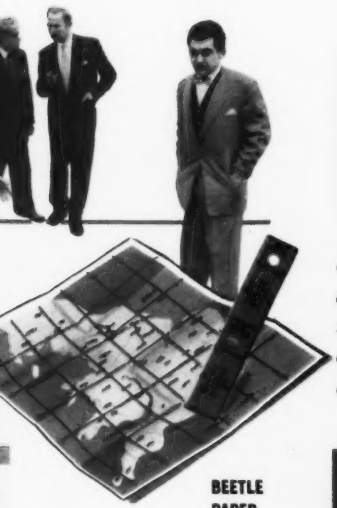
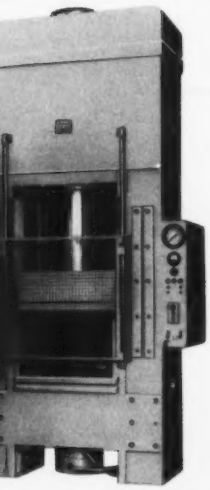
e on an INTERNATIONAL *scale*



BEETLE
PAPER
RESINS

Research and Development

The functions of our Research and Development Departments are two-fold—that of quality control and the creative work of forward research and development; the former to ensure the unfailing excellence of the products you use, the latter to provide you with new products and extended applications to help you solve specific problems arising in your manufacturing process. The implications of an international service obviously call for special attention to local requirements. We wish to give your individual requirements that special attention, and if you think our Laboratory Staff can help, do not hesitate to call them in.

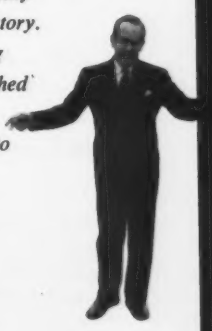


Product Design and Mould Design

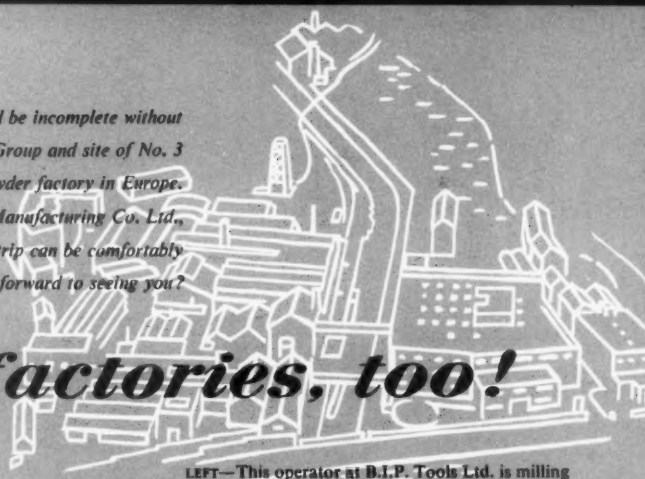
The B.I.P. Group is in the forefront in providing permanent, fully staffed Product Design and Mould Design Departments, whose services are available to all customers, without charge. B.I.P.'s product designers will produce original graphic designs for new moulded products, or redesign existing products for better appearance and ease of production; the mould design technicians, with whom they work in close co-operation, are always ready to assist customers in any problems affecting mould design. These two Departments, both singly and jointly, have achieved outstanding results at home and overseas in their closely related fields.

Technical Service

In your everyday work you doubtless meet with numerous production problems. Most of these you will yourself overcome, or with the aid of your local B.I.P. Agent; or by correspondence with the B.I.P. Technical Service Department at Oldbury. There are bound to be occasions, however, where the magnitude of the job or the complexity of the problem calls for specialised technical aid on the spot—at your own factory. This is when your local Agent calls in the B.I.P. "flying squad", the travelling technicians based on our Birmingham factories. This service has been established after very careful thought and it is based in Britain in order to keep in close touch with the latest technical developments. We at B.I.P. are very sensitive to your needs and these services are a token of the extent to which we are prepared to meet them, wherever B.I.P. products are in use.



A visit to the British Plastics Exhibition would be incomplete without a visit to Oldbury, headquarters of the B.I.P. Group and site of No. 3 factory—the most modern moulding powder factory in Europe. Within easy reach are the factories of Streetly Manufacturing Co. Ltd., B.I.P. Tools Ltd., and B.I.P. Engineering Ltd. The trip can be comfortably made in a day, so may we look forward to seeing you?



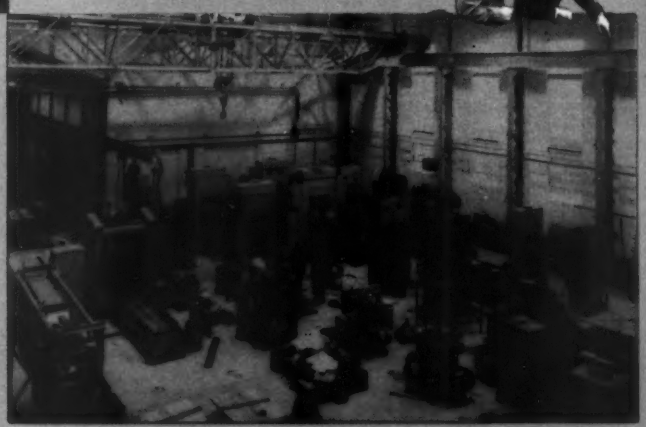
...and at our factories, too!

LEFT—This operator at B.I.P. Tools Ltd. is milling the dial cavity of a punch part for a telephone case mould.

CENTRE—General view of the assembly shop of B.I.P. Engineering Ltd. The premises have recently been extended for the third time.

BELOW—In reaction vessels such as these in the No. 3 Factory at Oldbury takes place the condensation of urea with formaldehyde to produce the resin syrup.

BELOW LEFT—Colour photograph of one of the reaction vessels in the No. 2 Factory, devoted to the production of industrial resins.



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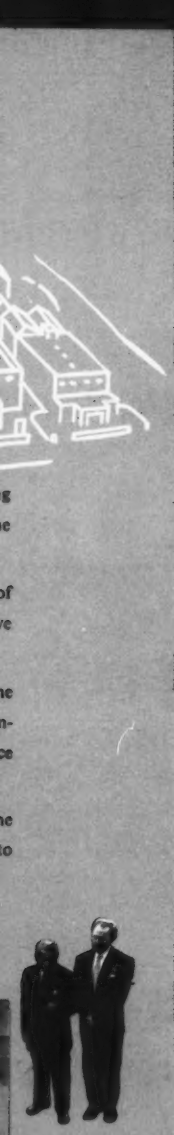
Factories at Oldb



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Factories at Oldbury, Streetly and Tyburn Road, Birmingham

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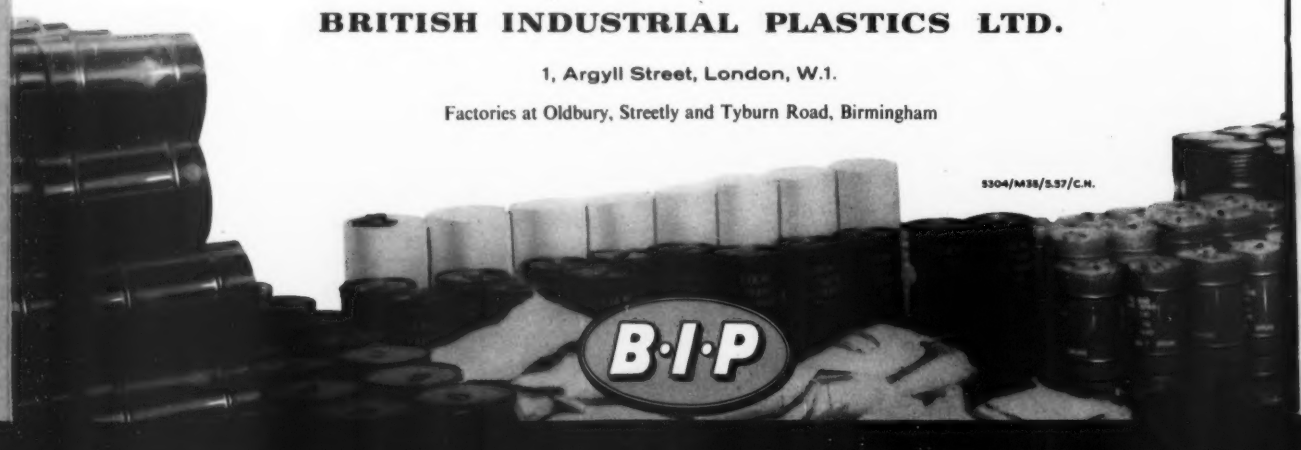


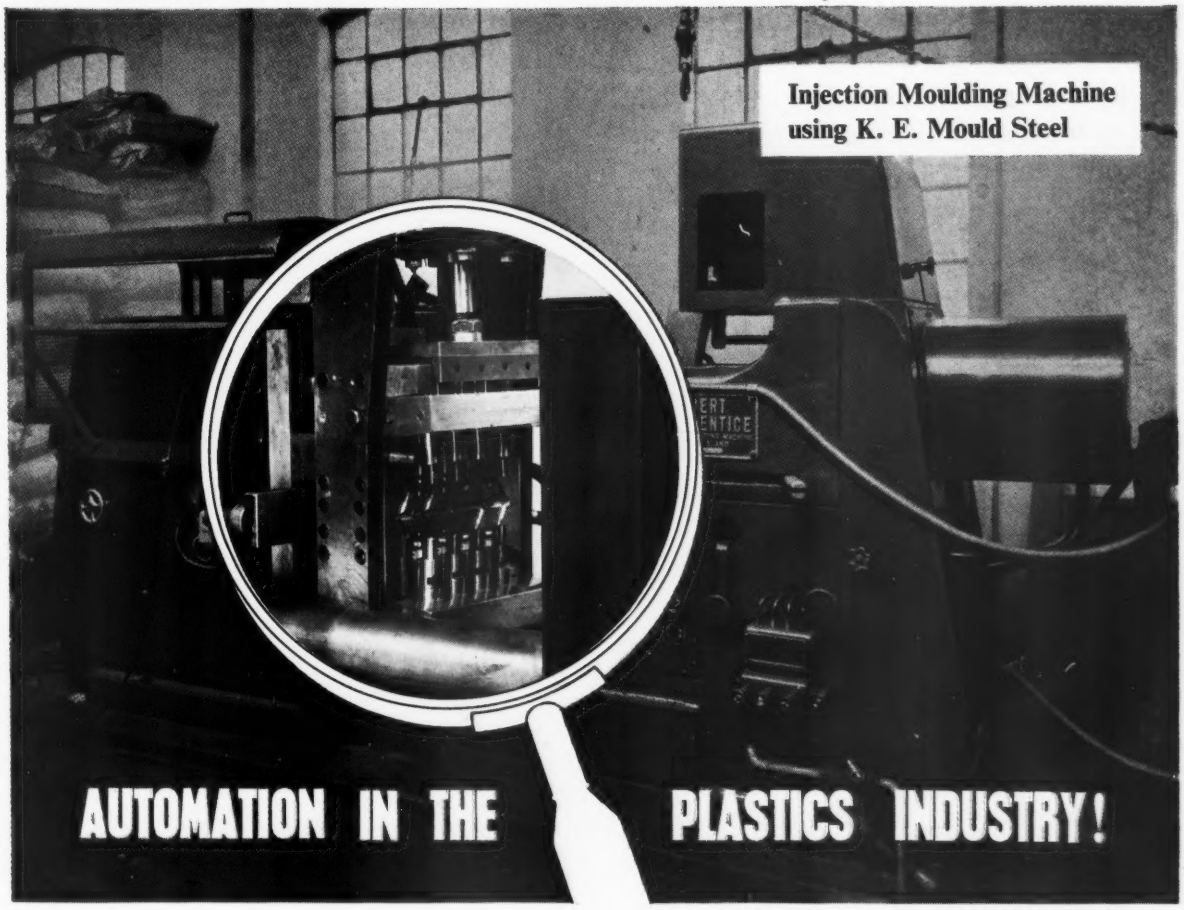


Illustration by courtesy of Wolseley Engineering Ltd.

REPEAT ORDERS ARE USUALLY AUTOMATIC ONCE KE HIGH GRADE MOULD STEELS HAVE BEEN USED

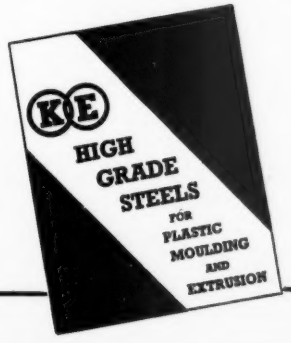
KE 355 Special Nickel Chrome Molybdenum Oil or Air Hardening Mould Steel.

KE 961 1½% Carbon 12% Chrome High Duty Mould Steel.

KE A28 Special Stainless Mould Steel.

Melted to close limits of analysis. Forged with an adequate reduction of area from the ingot to ensure the maximum amount of grain distortion. Carefully annealed to give optimum machinability and grain refinement. Ultrasonically inspected prior to despatch. These factors and almost one and a half centuries of steel-making experience give our Steels a high degree of regularity and reliability. These Steels have great strength and do not distort under the high pressure of injection moulding.

This booklet, giving greater detail, is available free on request.



KAYSER ELLISON & CO. LTD

CARLISLE STEEL WORKS · SHEFFIELD · ESTABLISHED 1825

we hold the stage

" *Explain yourself.*"
" With pleasure! See that shield?"
" *Well?*"
" It's made from 'Mirralon'. Looks just like metal, doesn't it?"
" *Amazing!*"
" Observe that coat of mail?" Made of 'Meculon' thread."
" *Go on.*"
" There is also the sword. There are the sequins on the lady's dress; not to mention her looking glass (unbreakable, of course). Added to these, there are —"
" *All right, all right! The achievement reflects great credit on you. Now let's have a few straight facts.*"
" Certainly, my dear fellow. At Dagenham we are now metallizing plastics films to produce two new products —

'MIRRALON'* is metallized cellulose acetate film for making sequins, dress ornaments, unbreakable mirrors and for general display purposes.

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" *Is that all?*"
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'MIRRALON' *and* 'MECULON' *are manufactured by* **MAY & BAKER LTD** · DAGENHAM · ENGLAND

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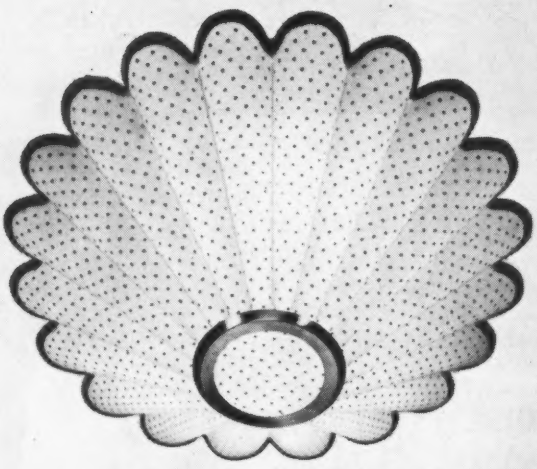

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For toughness—and extra-toughness . . . Lustrex Toughened 3 and Toughened 11.
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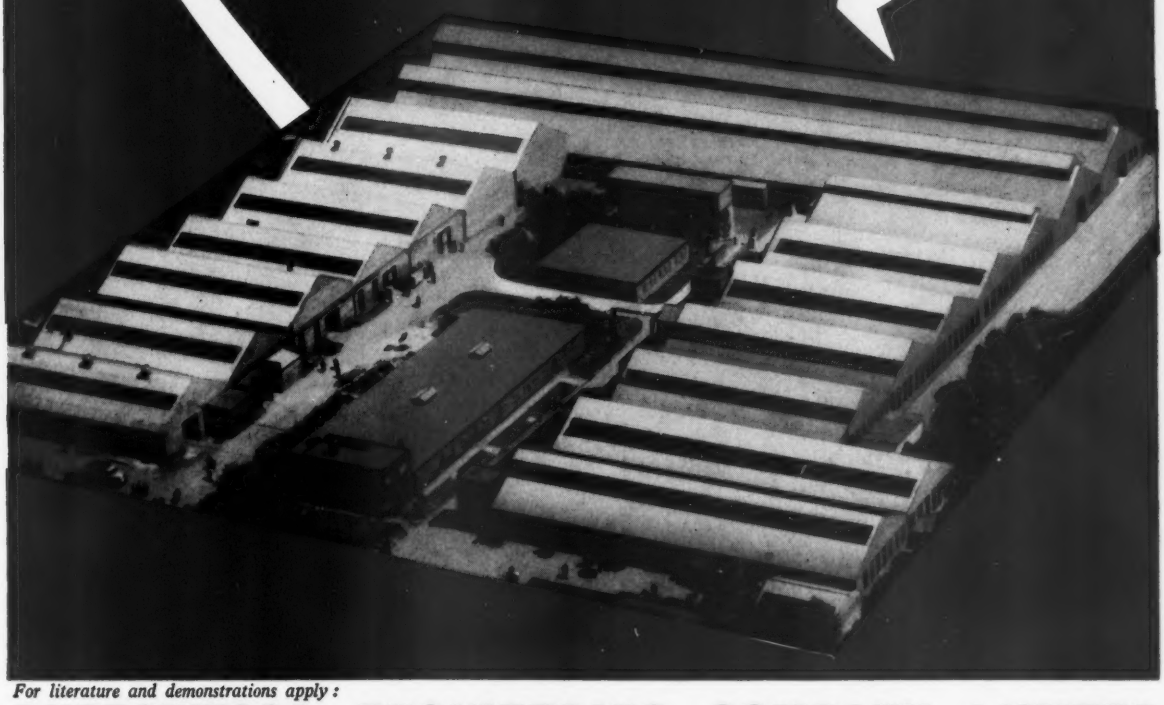

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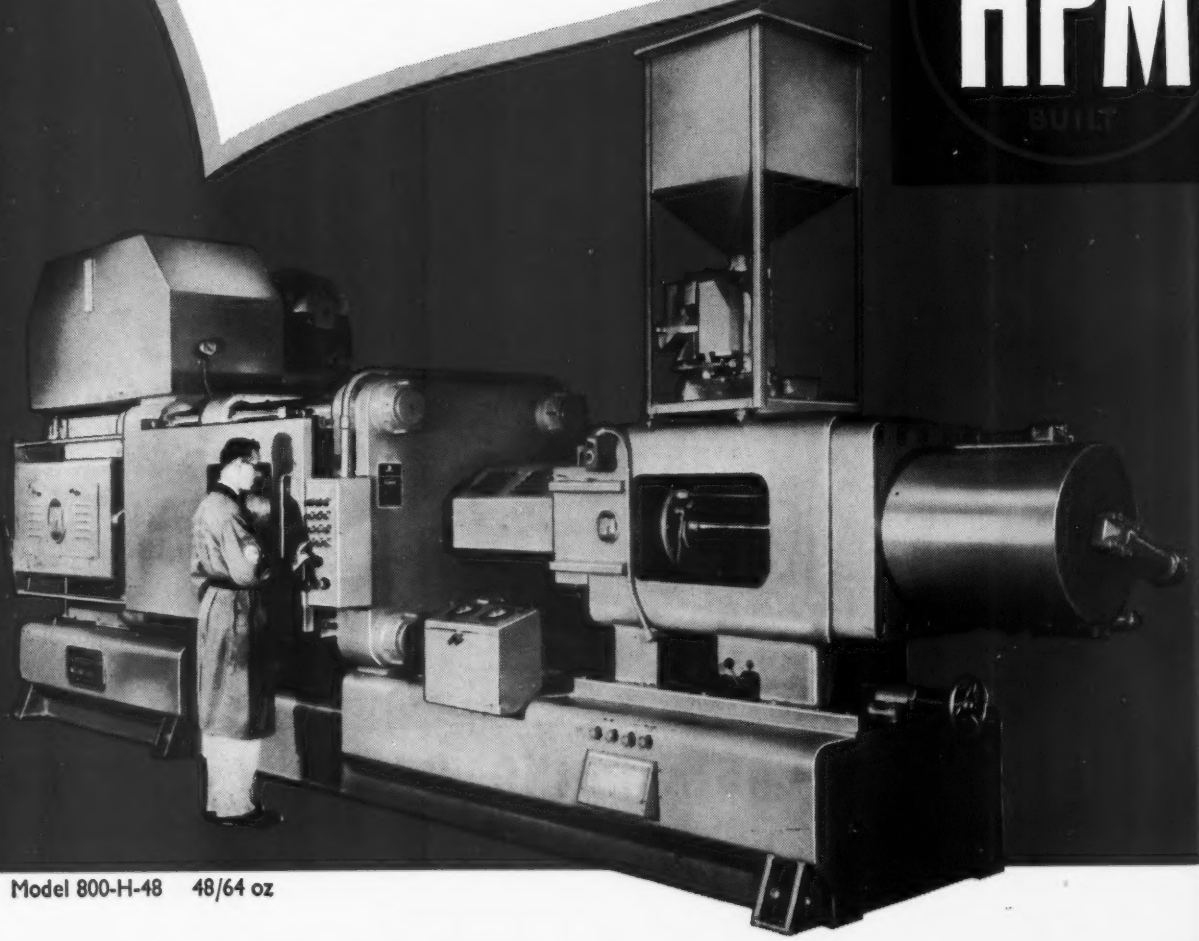

Model 800-H-48 48/64 oz

at lower cost per shot

Step up production with H.P.M. machines — the fastest injection moulders producing thermo-plastic parts at lower cost per shot than any other machines of comparable size.

They are fully automatic "all-hydraulic" machines possessing many outstanding features providing faster cycle times, powerful clamping and easy set-up, accurate material feed and high plasticising capacity.

In addition, they are economical with labour, floor space and material, and are dependable too. The machines range in size to meet every moulding need, and each unit is backed by over seventy years' specialist service.

PLASTICS INJECTION MACHINES

SPECIFICATIONS

	Model 300-H-12	Model 600-H-20	Model 900-H-40
Volume moulded per shot (cu. ins.)	20	34	81
Weight moulded per shot (ozs.)	12	20	48
A.P. capacity at double stroke feed (ozs.)	14	23	54
Plasticising capacity (lbs./hour)	135	200	240
Rate of injection (cu. ins./second)	14	17.3	48
Size of die plates	30" x 22"	36" x 32"	48" x 36"
Space between tiebars	17" x 20½"	21" x 27"	31½" x 39½"
Daylight	28"	33"	39"
Mould opening stroke	30"	40"	53"
Maximum die	24"	34"	47"
Maximum die with spacer	18"	27"	36"
Minimum die	6"	7"	11"
Minimum die with spacer	220	320	500
Mould locking force (U.S. tons)	200	283	472
Mould locking force (long tons)	100	141	235
Capacity of hopper (lbs.)			
Heating power (K.W.)	21.8		
	40 h.p.		
	2.8		
Overall length x width	19' 6" x 5'		

Wickman

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It is with pleasure that we acknowledge your request for further information regarding our "Comprehensive Service" - a new trouble free method for plastics Raw Material purchasing which you will find can substantially reduce your total expenditure on [illegible] Within the [illegible] materials [illegible] your [illegible] our [illegible]

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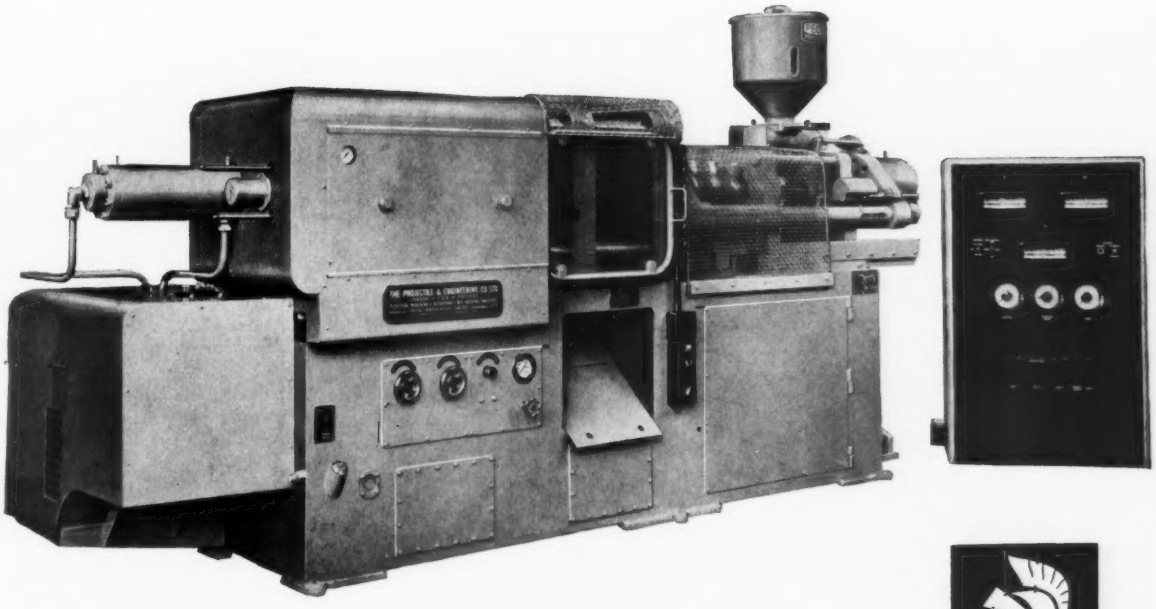
P6

½ oz.—160 oz. capacity fitted with conventional or pre-plasticising injection units

Injection Moulding Machines



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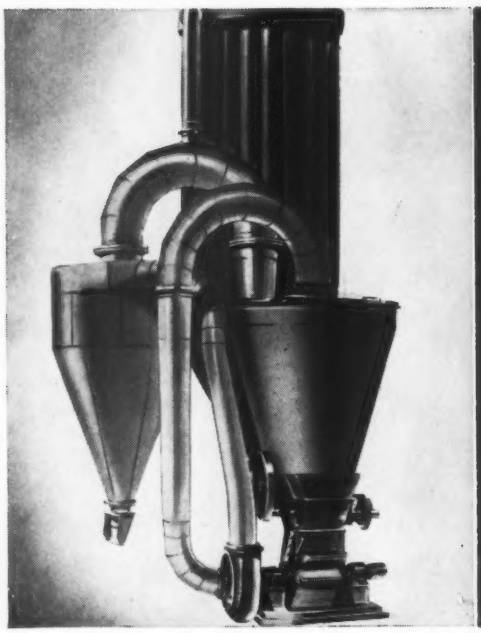

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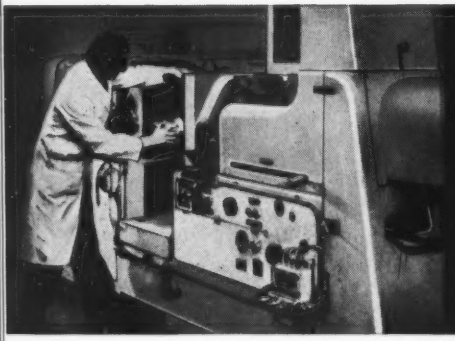
STREETLY MOULDINGS

The Streetly success story stems from the skill of our engineers and technicians, the consistency of quality and high productivity of BIPEL presses; and the versatility of our equipment.

Streetly service enables the customer to obtain from a single reliable source both thermosetting and thermoplastic moulded components. On the compression side, we are now completely equipped with BIPEL presses—the key to mass-production of quality mouldings.

Reliability of deliveries in terms of quality, quantity and time has always been our special concern. That this represents solid achievement, and not a mere claim, is implicit in the status of our customers and the long periods during which we have consistently served them.



INJECTION MOULDING

A typical press in our injection moulding shop, equipped with ½ oz. up to 8 oz. machines. All kinds of thermoplastic materials are moulded.

BELT CONVEYOR SYSTEM

A typical scene in the Streetly finishing shop. Remington shaver cases are finished and inspected on the conveyor line.

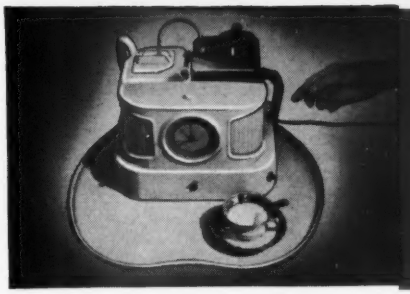
The Streetly Manufacturing Company Limited

Streetly Works · Sutton Coldfield · Telephone: Streetly 78411

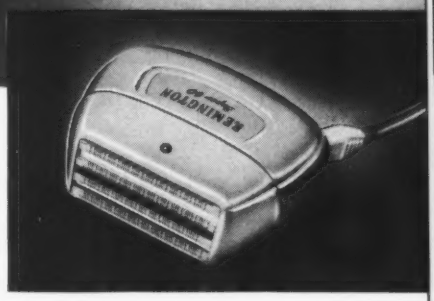
B·I·P

Streetly *The*

The Goblin Teasmade incorporates mouldings large and small in thermosetting and thermoplastic materials. The largest moulding weighs 2 lb. Bipel auto-control presses, Types 40, 100 and 200 are used for different thermosetting components.

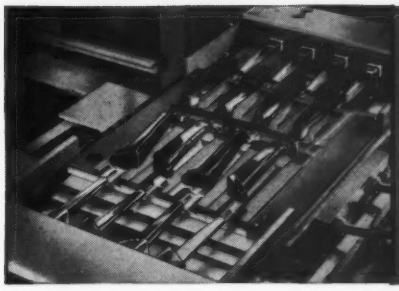


The Remington Super 60 Electric Shaver. Streetly makes the housings, and very close tolerances have to be maintained to ensure a perfect fit. Moulded in a Type 100 BIPEL auto-control press.



...in the long run —

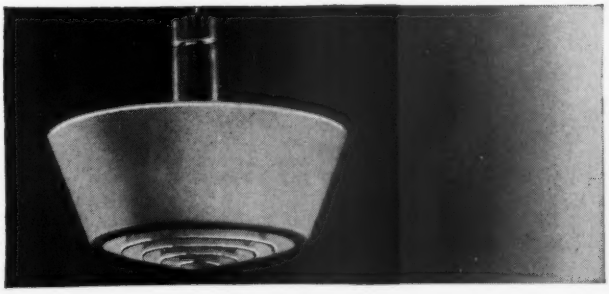
Alongside are shown a few of the products of famous firms for whom we have been making major components for many years. The continuity of these contracts over long periods is no mere coincidence, for we are equipped and organised for the production of quality mouldings on a mass-production scale. Our prompt deliveries are 100% usable, for we apply the most scrupulous attention to detail in moulding, finishing, inspection and right down to final packing.

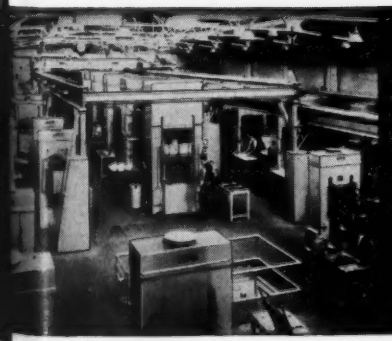


The Prestige Pressure Cooker handle. Actually two handles, upper and lower are required, carefully designed to meet together. The tool produces four upper and four lower handles per cycle. A Type 200 BIPEL auto-control press is used.

The Esterbrook Desk Pen Set. Another example of Streetly versatility, for both thermosetting and thermoplastic mouldings are required. The pen tapers have to be moulded to optical standards and all components highly finished.

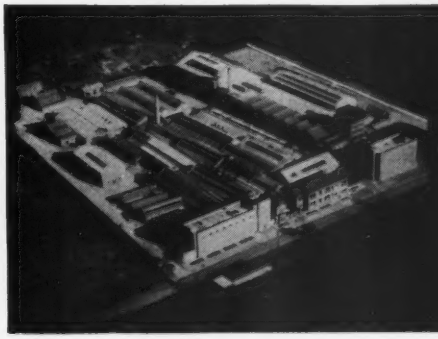
The Ventura 80 Light fittings The problem was to avoid flaws or flow marks in the translucent material. This was overcome by skilful tool design and the consistent cycle of the BIPEL Type 200 press.





STREETLY MOULDING SHOP

The main shop. BIPEL presses throughout give a pressure range of 20-300 tons. There are two 1,000 ton compression presses.



STREETLY WORKS

Illustrating the extensive area of Streetly Works. All the moulding shops are situated to the left of the dark diagonal shadow.

The Comprehensive Moulding Service

STREETLY MOULDINGS

STAND No. J.10

FILABOND
POLYESTER RESINS

were used in the Fabrication of the NEW L.C.C. AMBULANCE

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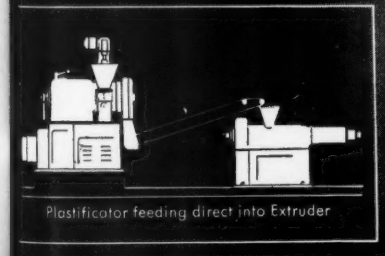

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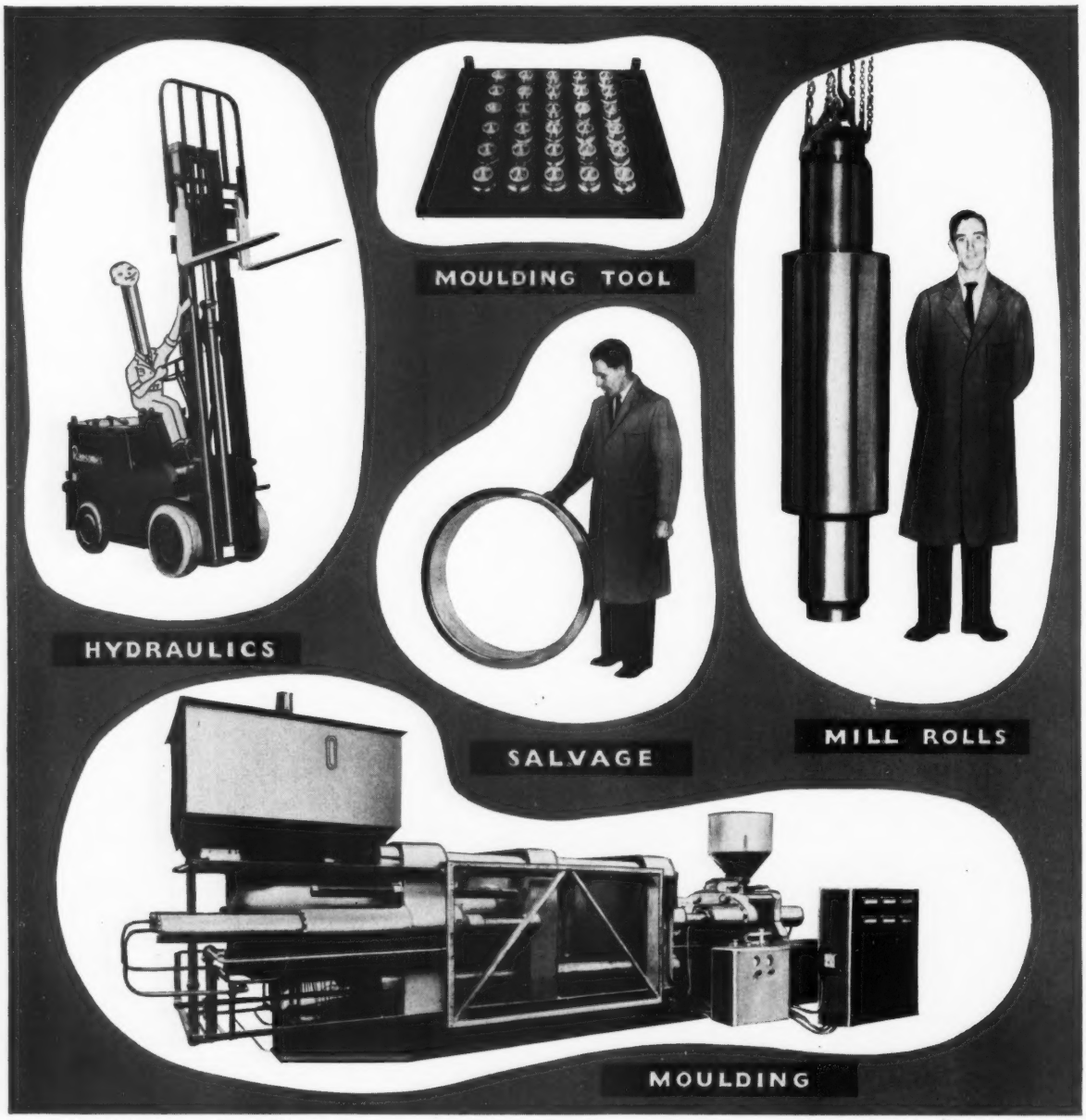

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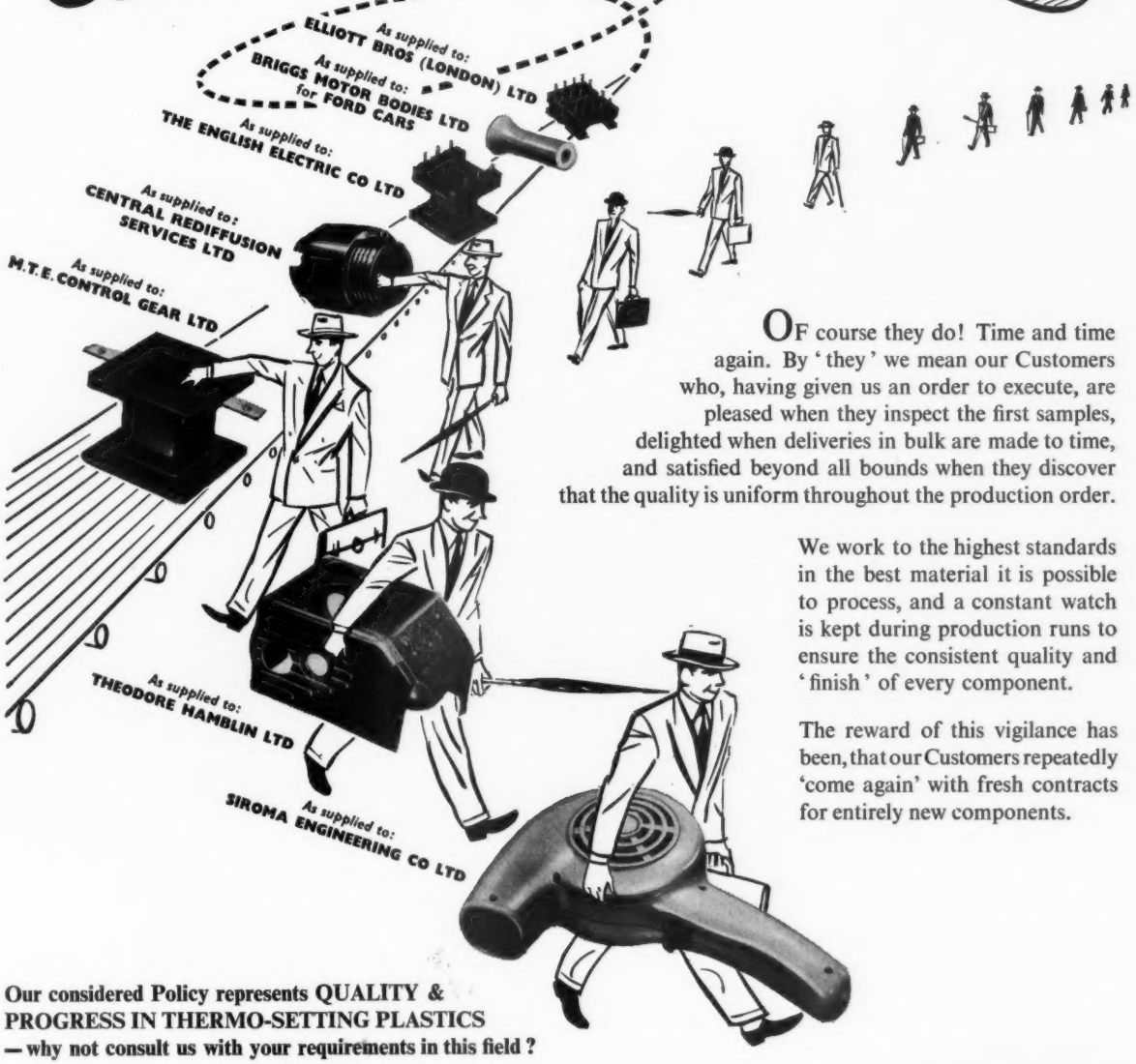
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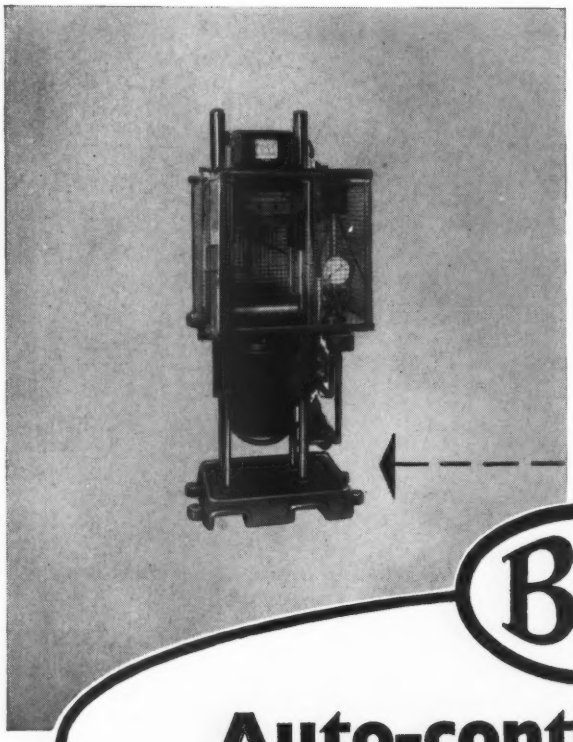

No. 501 Type W/1

25-Ton Fast Cycling Upstroking Press, fitted with "easiest to set" controller for all compression cycles. Operated by push-button or by closing the operator guard.

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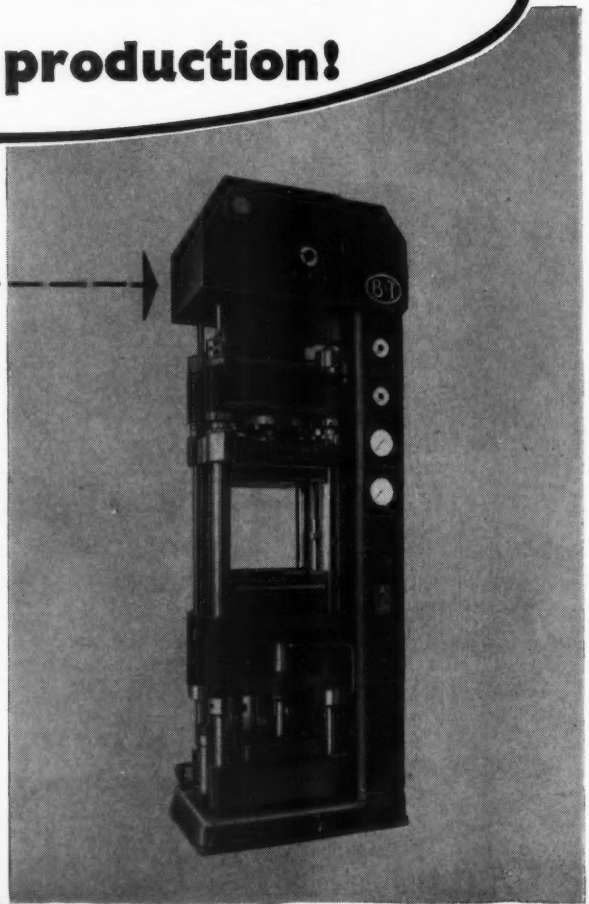
Auto-control Presses for quality production!



No. 536 Type U/1

150/35 Ton Universal Compression and Transfer Press with Auto Cycle control to repeat any thermosetting moulding cycle including "breathing" and "dwell," automatically. Push-button start and automatic guard operation.

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LAMINATES
stretch back or drills
*without adhesives!**

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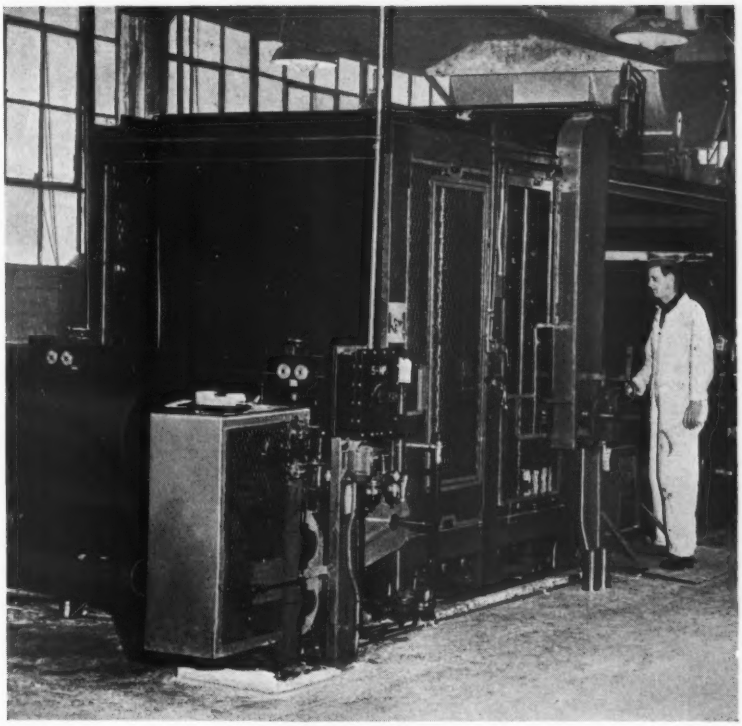
VALLEY PRINTS
to closest tolerances



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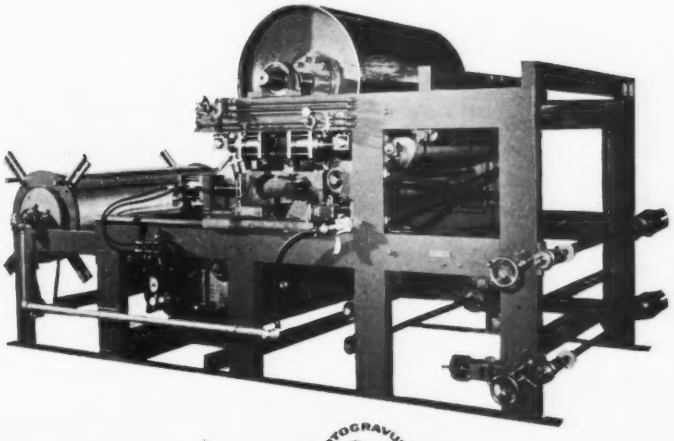

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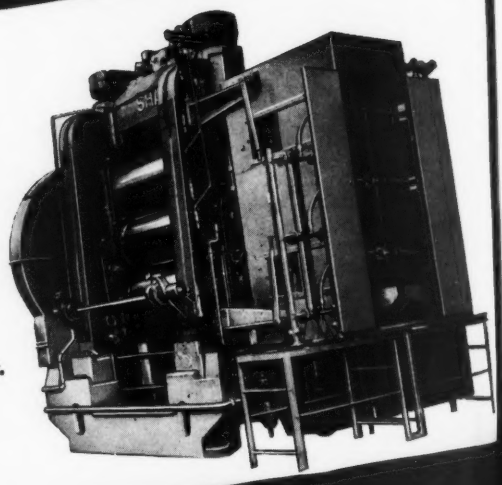

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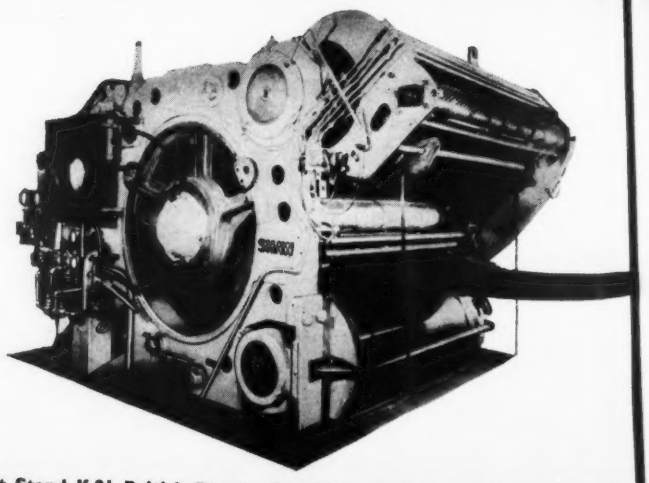

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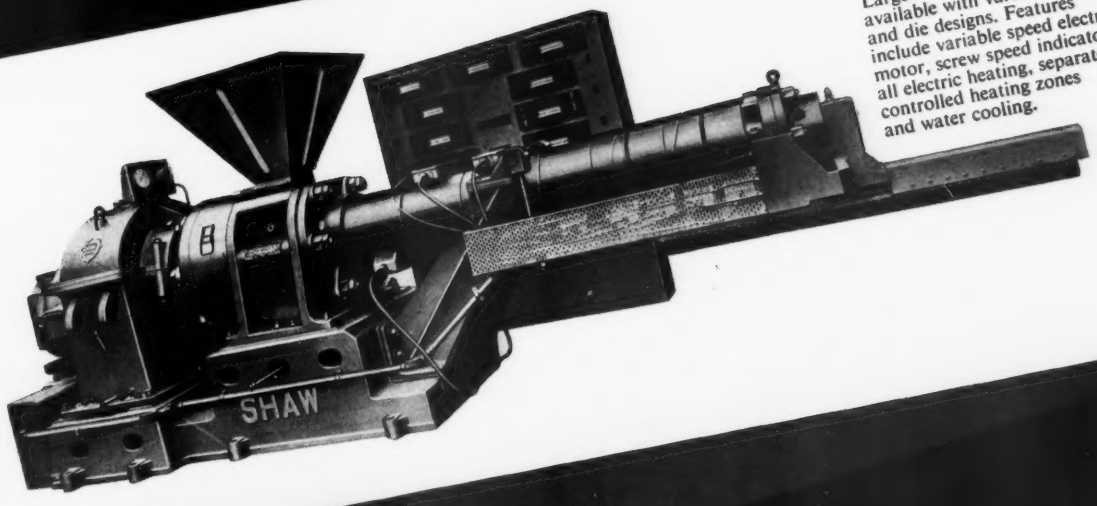

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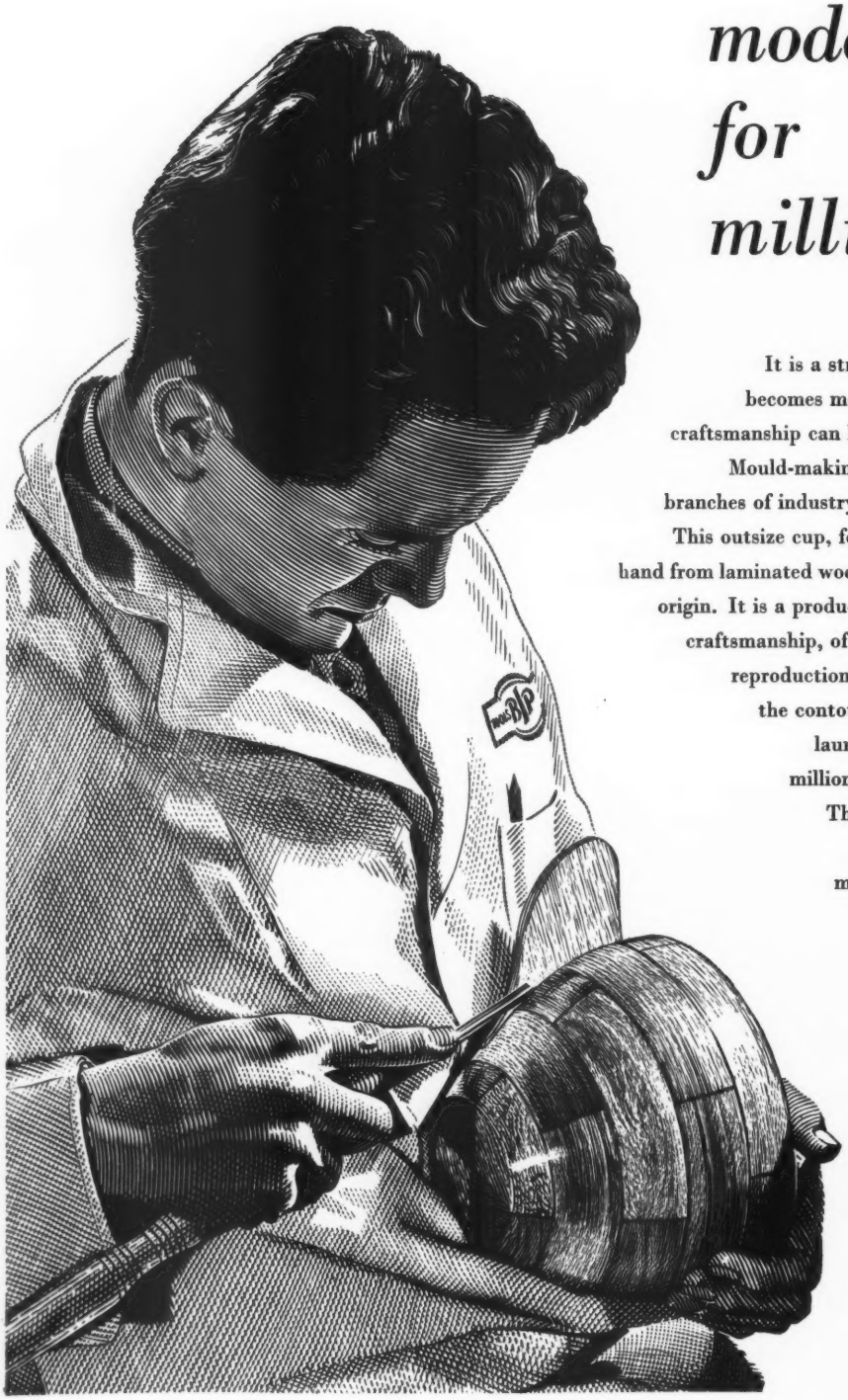

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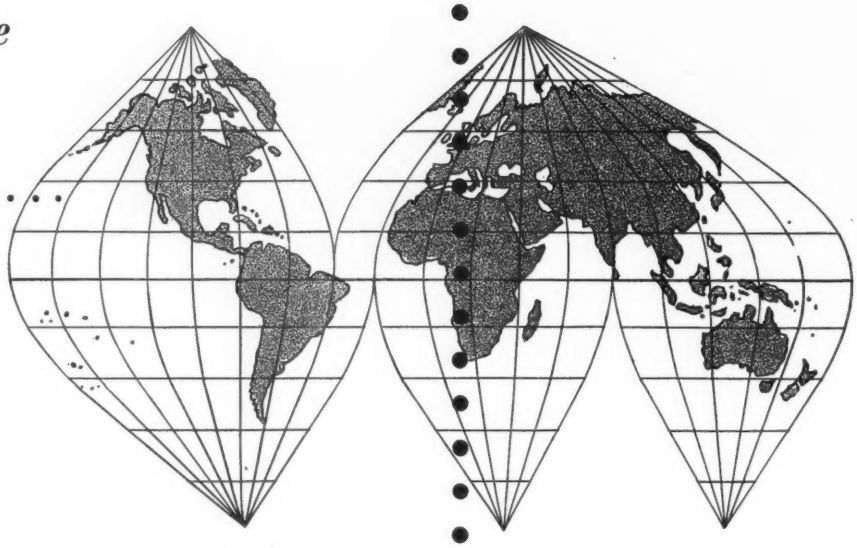

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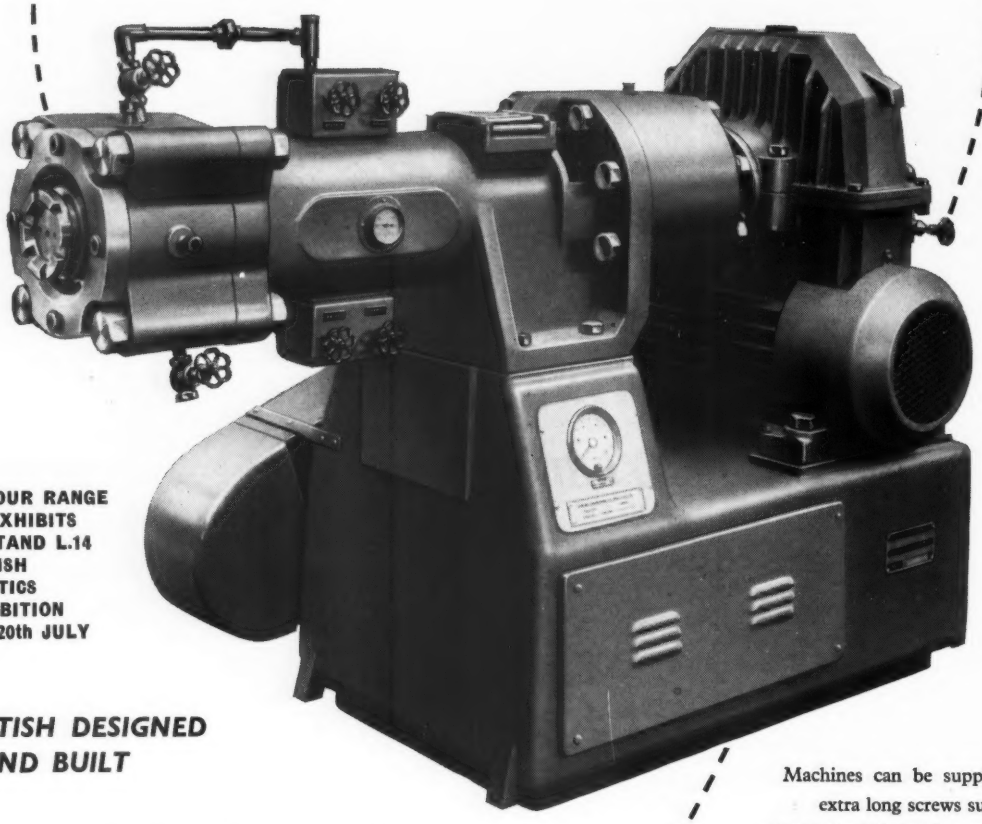

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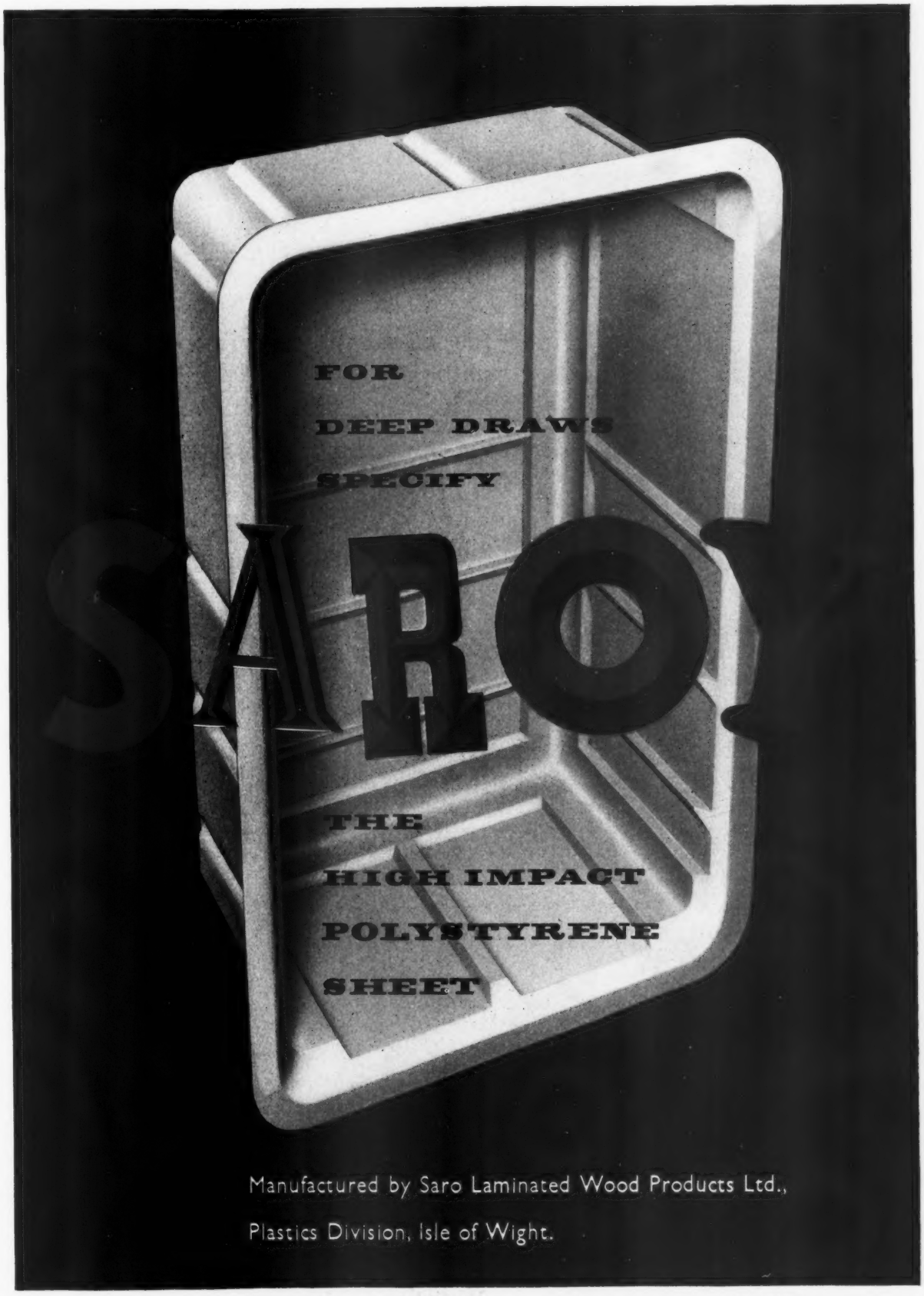

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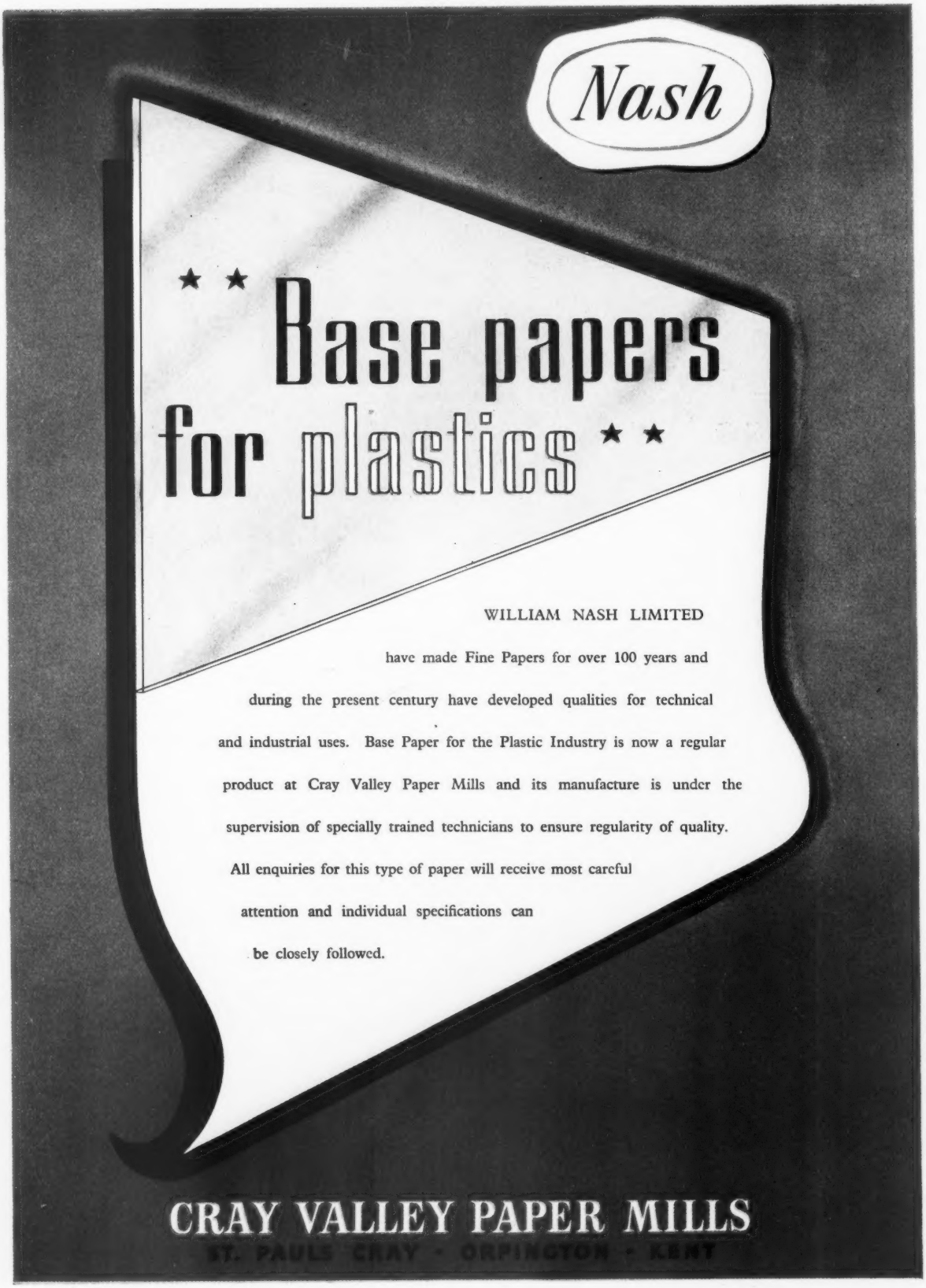
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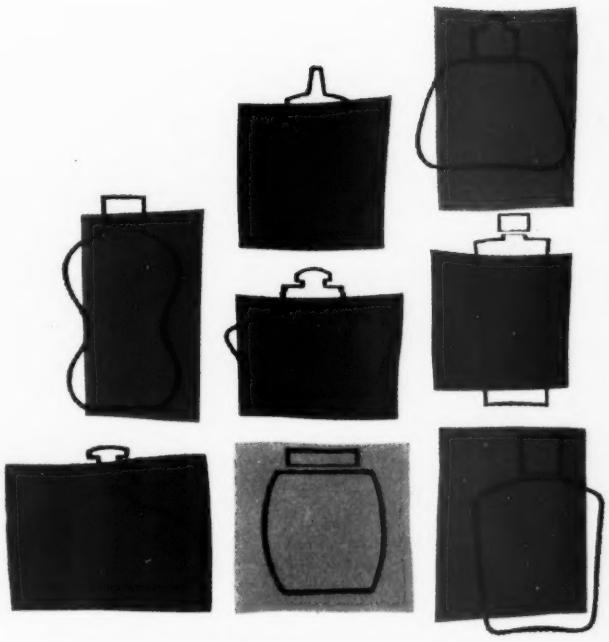

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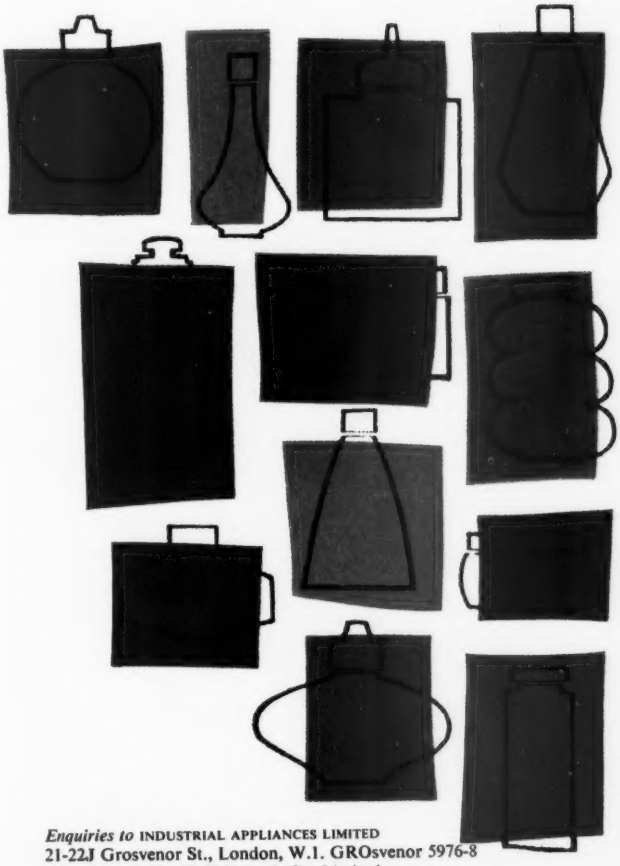

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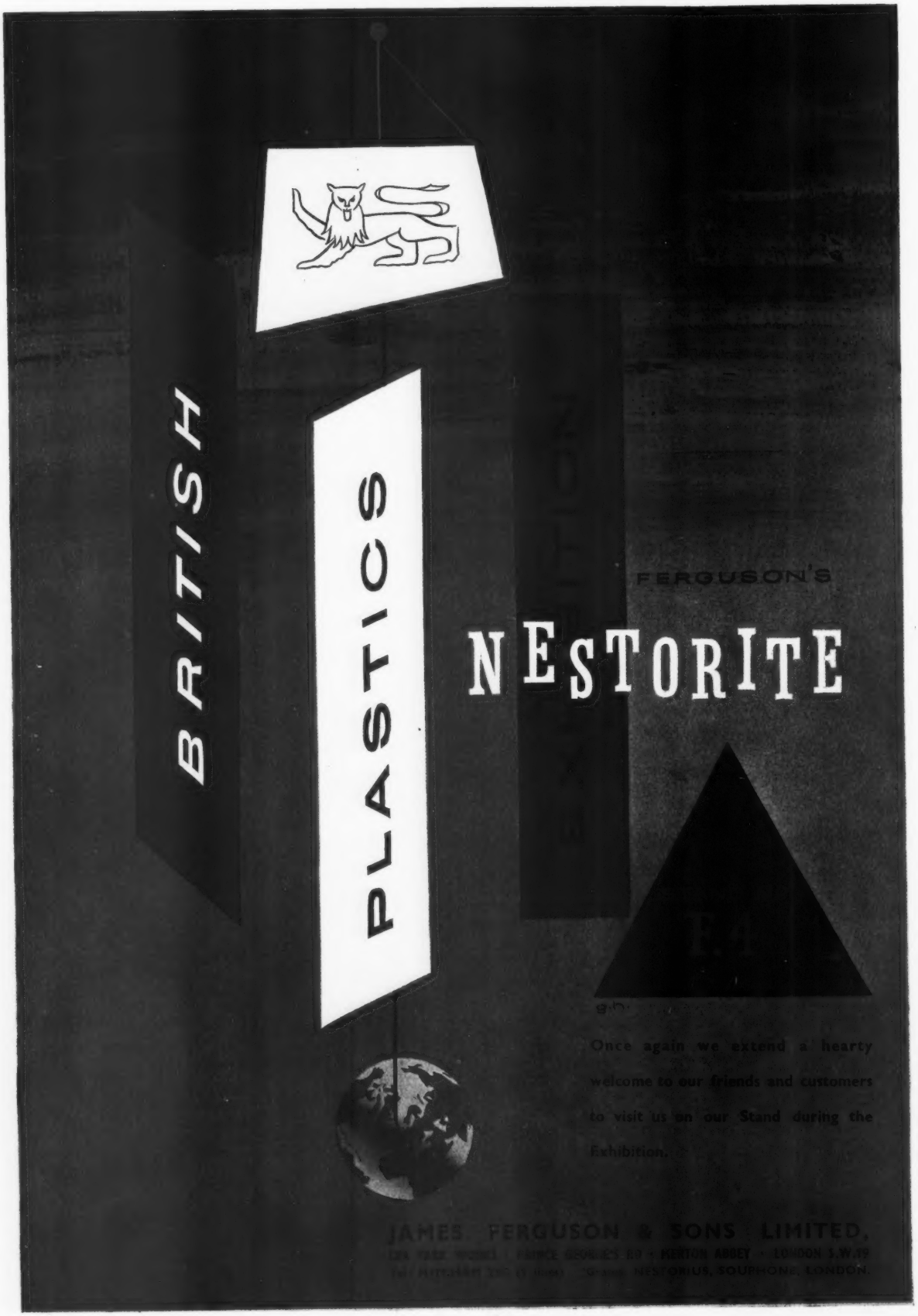
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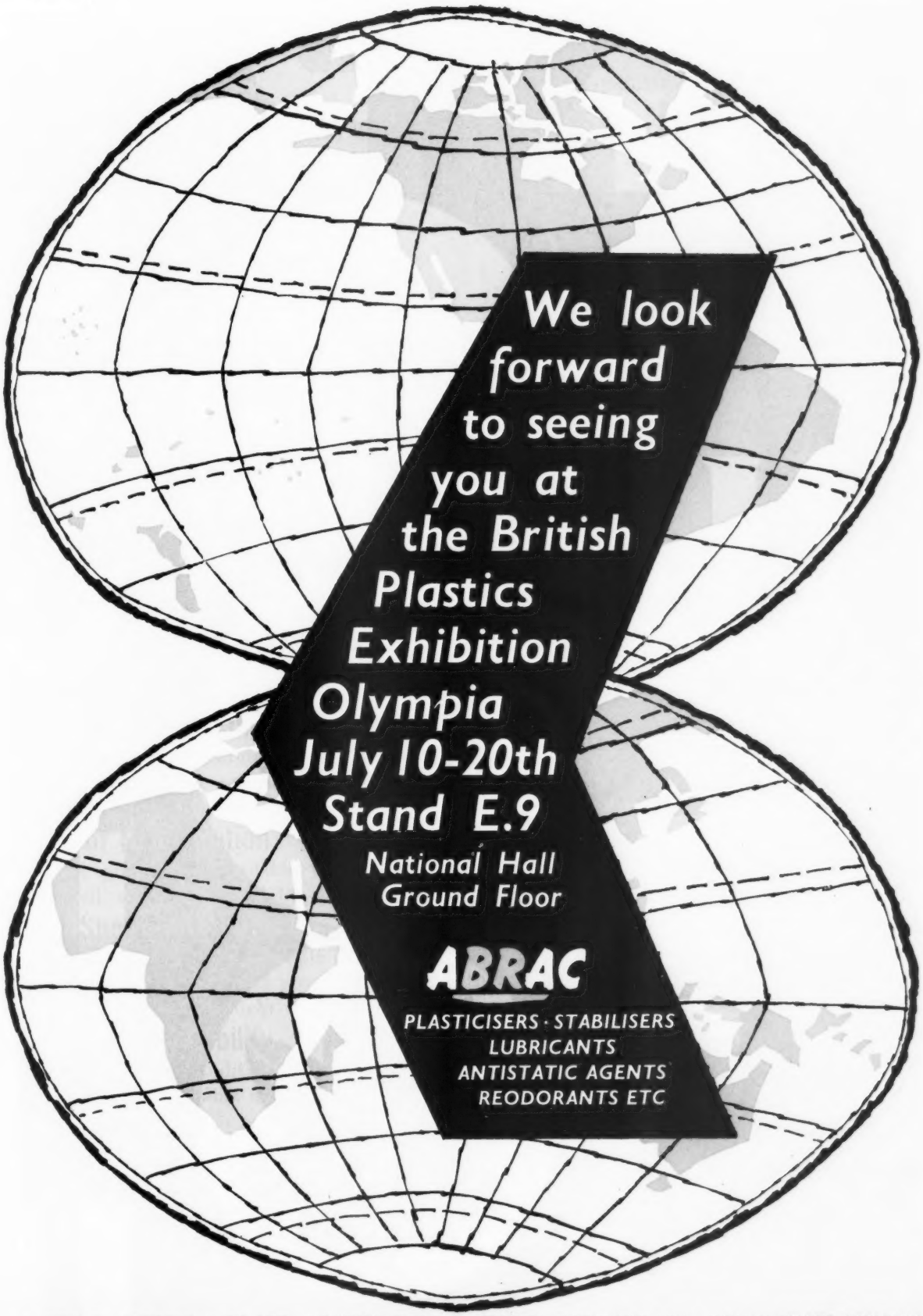
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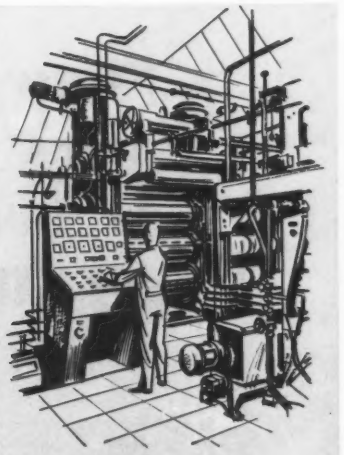

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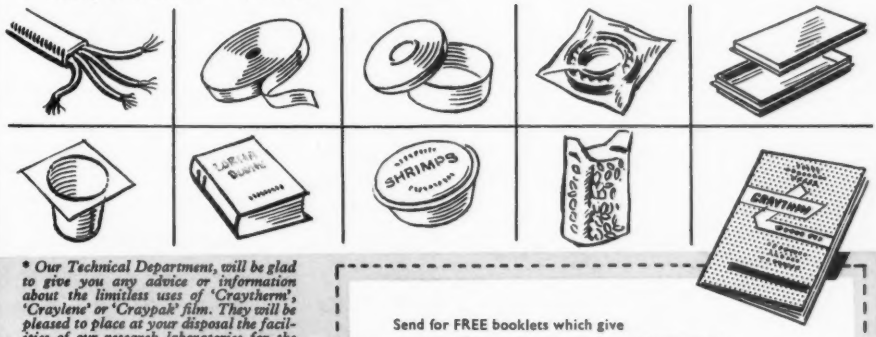

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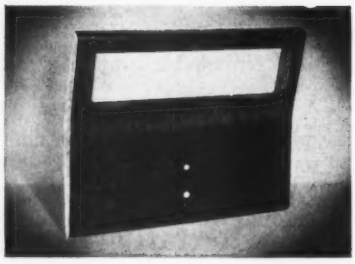

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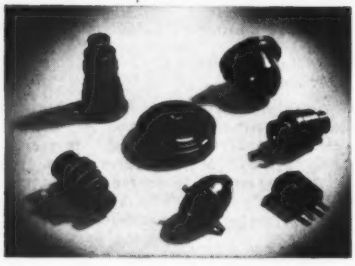

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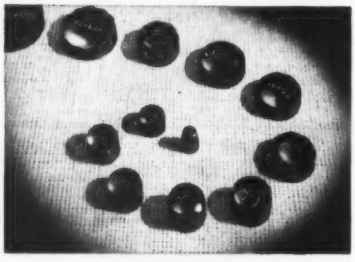

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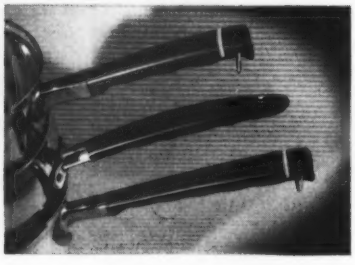

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S.16

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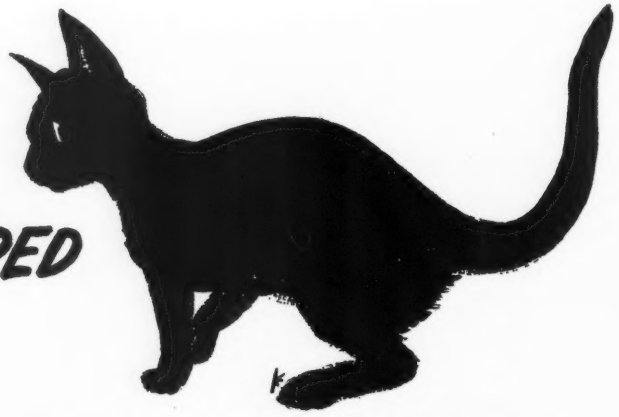

20

INSTALLATION AND OPERAT

many years, the company has made a speciality of engineering complete processing set-ups. Developed from start to finish by company engineers, each of these layouts is composed of production machines matched in capacity to prevent the "choking" or "starving" of succeeding units. Production flows without costly interruptions and with manual aid and supervision reduced to a minimum.

Where the mixer is located on a mezzanine directly above the sheeting mill, the mixed stock, when discharged, drops into the bite of the rolls and can be

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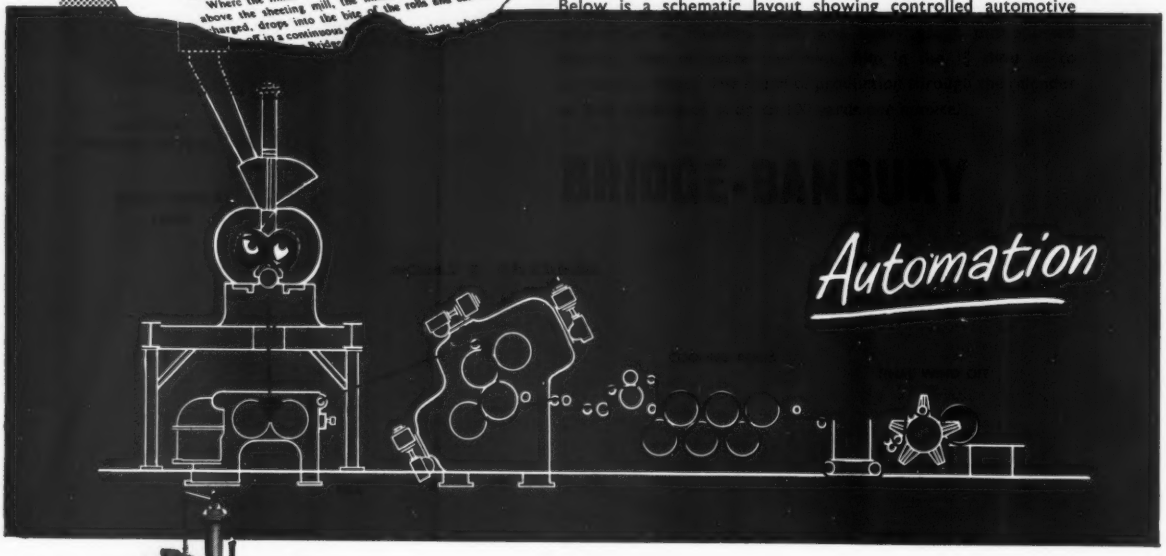
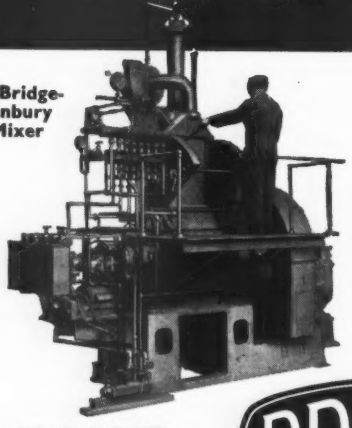
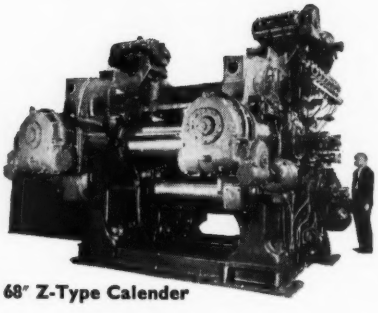


3A Bridge-Banbury Mixer



22" × 60" Mill



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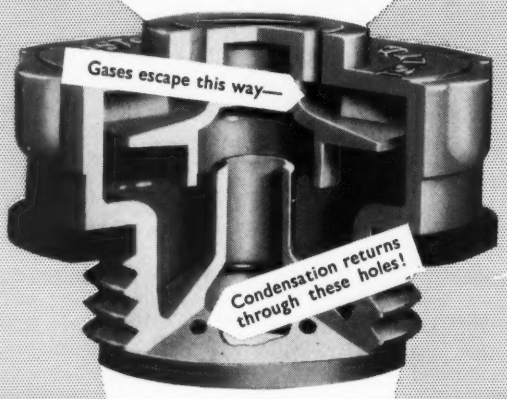
How the Tungstone plug works



WHEN driving a Service vehicle in varying climates, an efficient battery is vital. A lot depends upon the battery plug! The kind that Messrs. Tungstone Products required was a plug which enabled the battery to breathe! In other words, it must allow acid vapours to escape—prevent dirt penetration—and ensure the return of all condensation to the battery cells.

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NO LONGS

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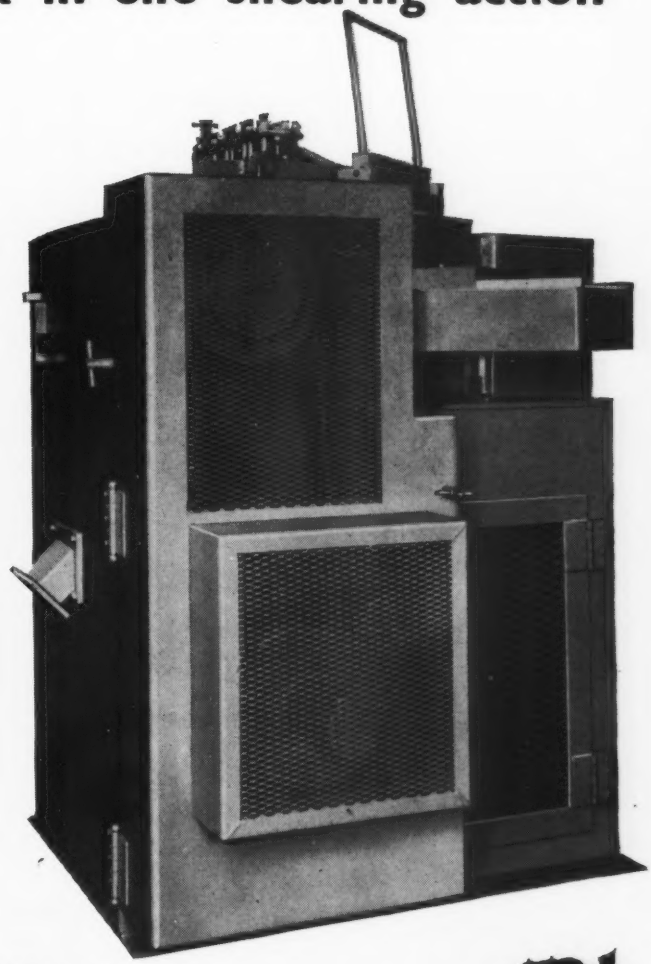
Cut from sheet stock in one shearing action

THE BURTONWOOD CUMBERLAND "STAIR-STEP" DICING MACHINE

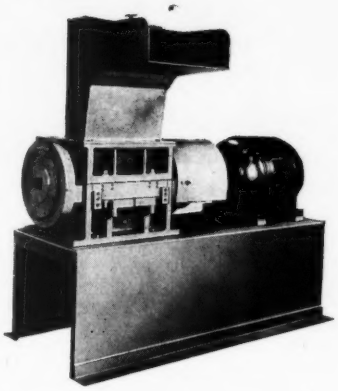


Burtonwood-Cumberland "Stair-Step" Dicing Machine offers you a completely new method of dicing plastic materials. Perfect cubes, free from longs, are cut from sheet stock in one shearing action! All sides of the cube are cut cleanly. Cubes or rectangular pellets may be produced in various sizes ($\frac{1}{16}$ in. to $\frac{1}{2}$ in.) by simply changing knives.

This new dicing principle makes it possible to dice the full range of plastic materials, including polyethylene, vinyl, acetate and nylon. Two standard machine sizes accommodate sheets up to 7 ins. or 14 ins. wide. Machines to handle greater widths can be specially built. Write for complete technical details.

FOLLOW THE LEADERS
This Equipment is used by leading cable and plastic manufacturers throughout the world.

GRANULATING MACHINES



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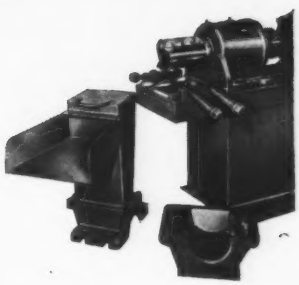

MODEL $\frac{1}{2}$
High capacity small machine, suitable for placing adjacent to individual injection mouldings machines, for sprues and rejects.

Manufactured under licence from Cumberland Engineering Company, Inc., United States

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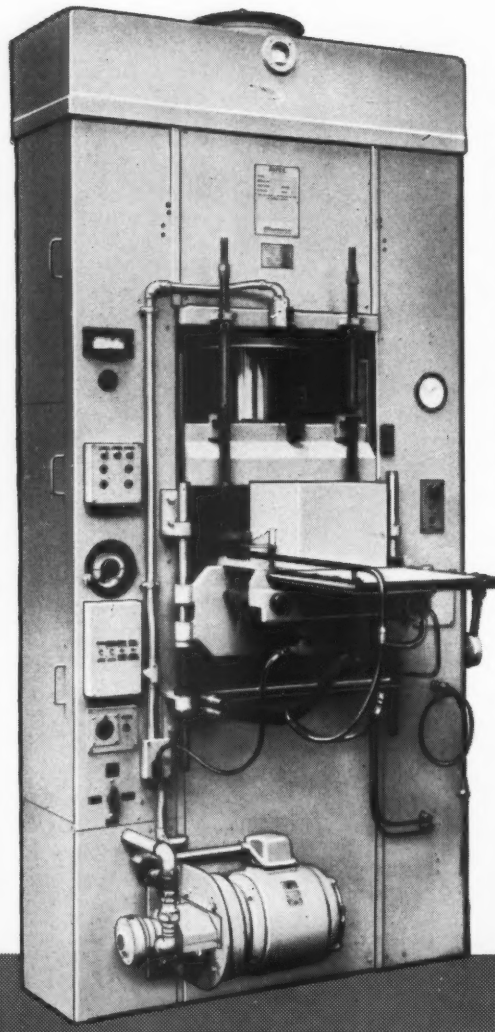
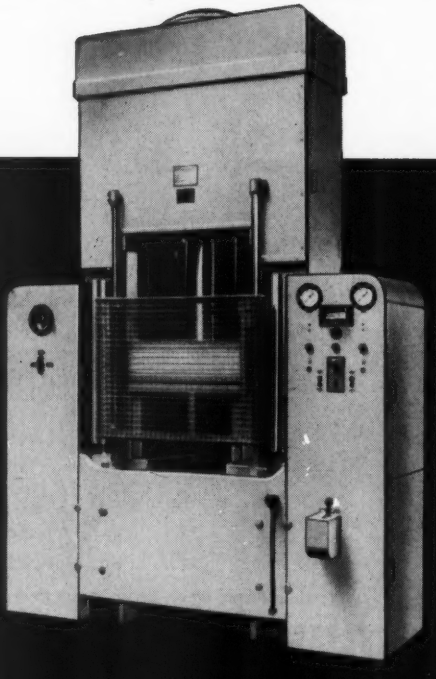
On every score, BIPEL adds up to increased production, reduced effort; figures of up to 20% increase are by no means unusual. If you are re-equipping, be sure to see BIPEL first—our engineers are always ready to help.

SEE US AT STAND NO. H.9



BIPEL 60-TON FULLY AUTOMATIC PRESS

BIPEL fully-automatic presses have been operating successfully for four years for British moulding concerns. This is an improved model incorporating numerous modifications with special reference to quick adaptability for short runs.



BIPEL TYPE 100 DOUBLE-ACTING SIDE RAM PRESS

This auto-control, line feed, double-acting side ram press gives main ram pressure of 150 tons maximum, with 18" stroke; side ram — 100 tons, 5" stroke each side.

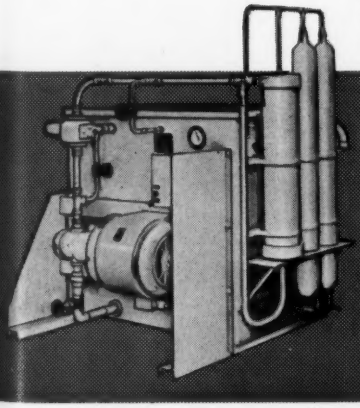
The Bipel System

e PRESS PLANT

TYPE 40		TYPE 100		TYPE 200		
English	Metric	English	Metric	English	Metric	
24"	610 mm	38½"	975 mm	47½"	1190 mm	Daylight Between Tables
14" x 14"	355 x 355 mm	20" x 20"	505 x 505 mm	30" x 30"	760 x 760 mm	Maximum Standard Heating, Platen Sizes
12.6 tons	12.8 tons	26.9 tons	27.3 tons	50 tons	50.8 tons	Transfer Ram Pressure

BIPEL RANGE OF AUTO-CONTROL PRESSES

The basic range of three auto-control presses for compression and transfer moulding, covering moulding pressures from 20-300 English tons. These presses can be individually supplied with compact, built-in hydraulic drive units; or line fed with hydraulic pressure at 1,000 p.s.i. from a centralised drive unit for multi-press installations.



BIPEL (SINGLE AND TWIN) HYDRAULIC DRIVE UNITS

Available in two standard types, the larger delivers up to 36 gallons per minute of pressure fluid at 1,000 p.s.i., this being sufficient to drive up to 16 tons *Type 100 BIPEL* presses. Other sizes are designed to suit specific requirements.

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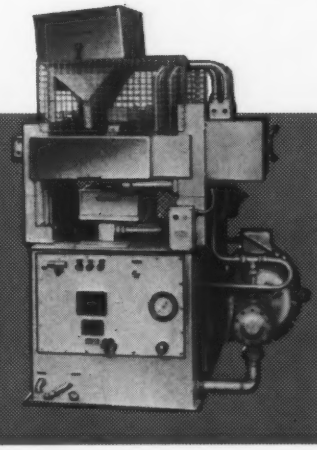
This reliable, efficient machine will make 22,000 1" pellets per hour and is specially designed for ease of tool changing and trouble-free operation. Also available is a range of single-punch horizontal hydraulic pelleters with maximum pressures of 12, 35 and 70 English tons respectively.



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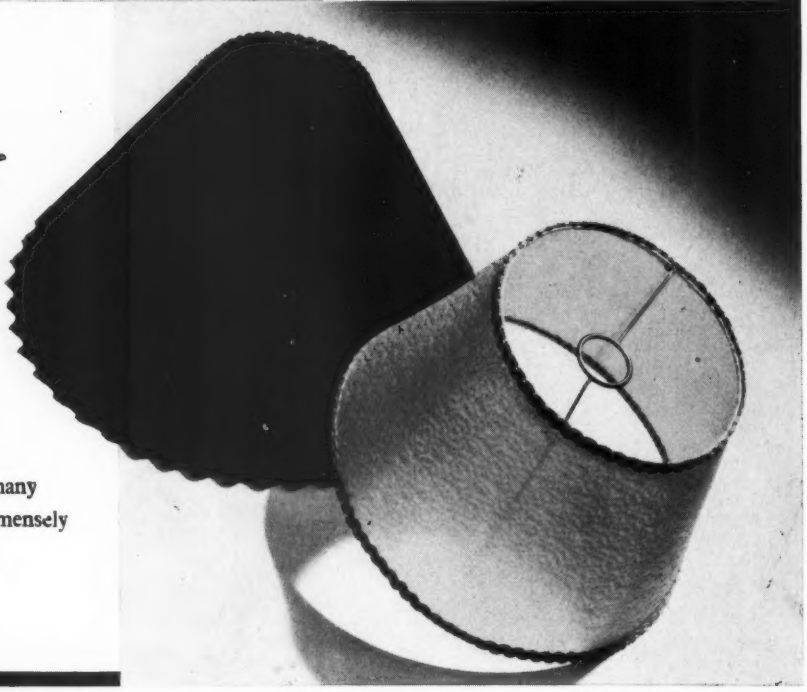

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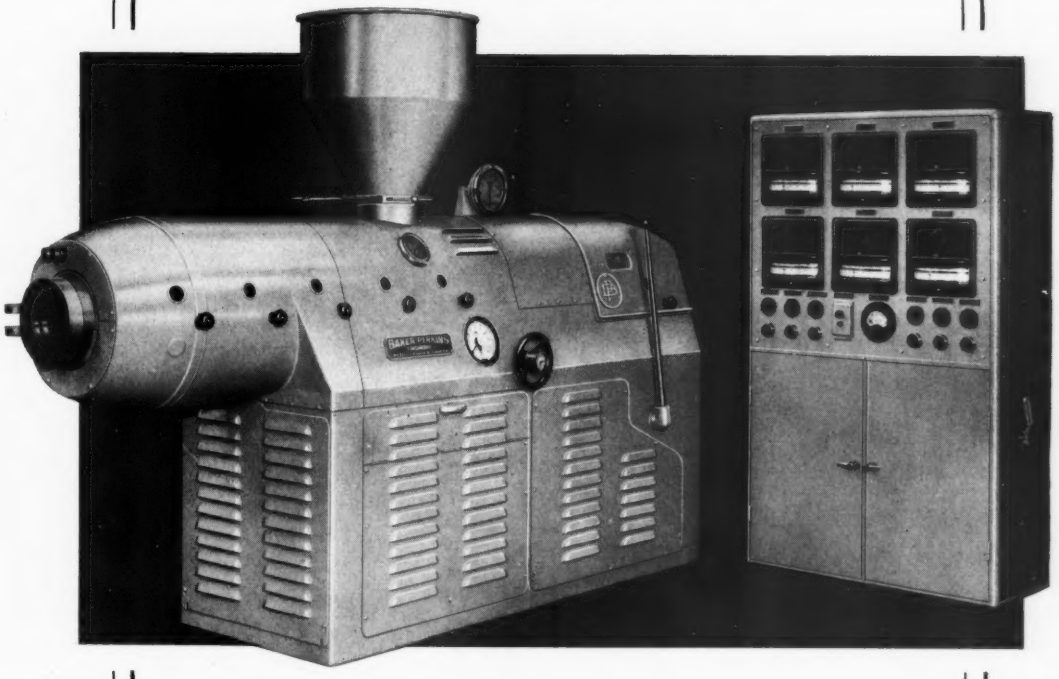

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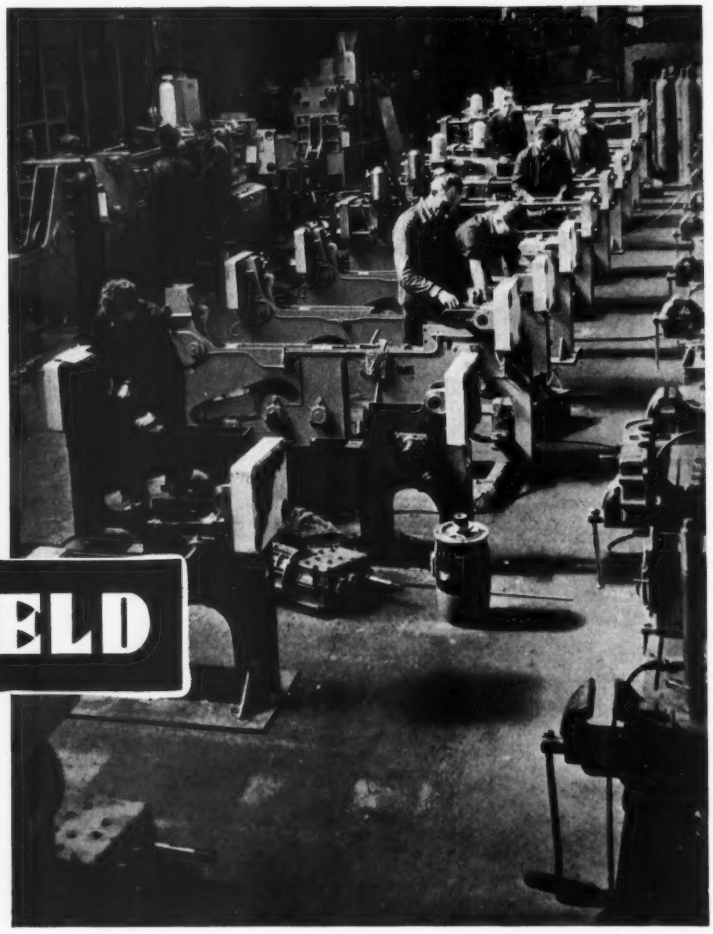

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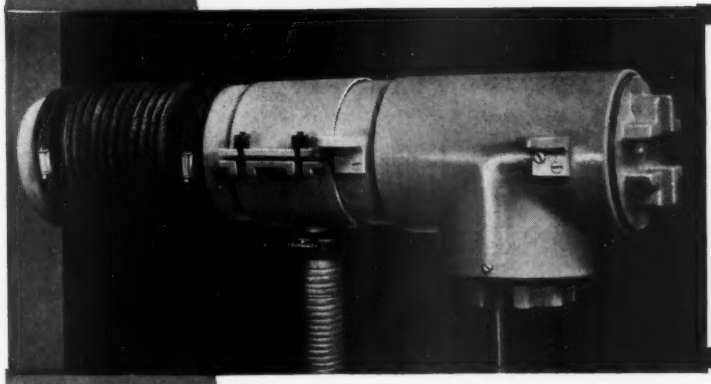

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Plastics

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EDITOR: M. D CURWEN, B.Sc., A.R.I.C.
ASSISTANT EDITOR: C. W. WELCH

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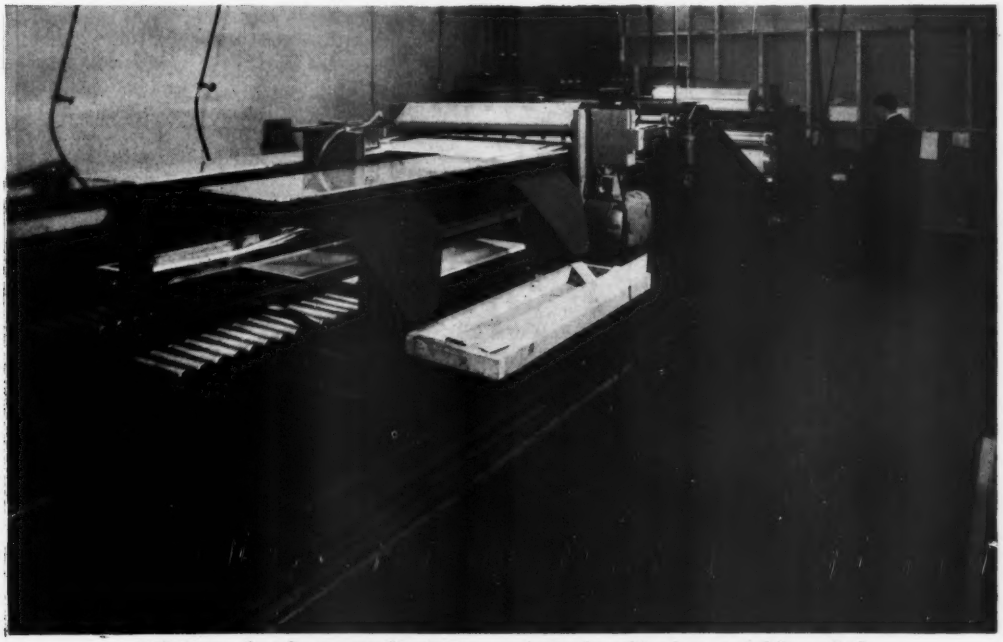
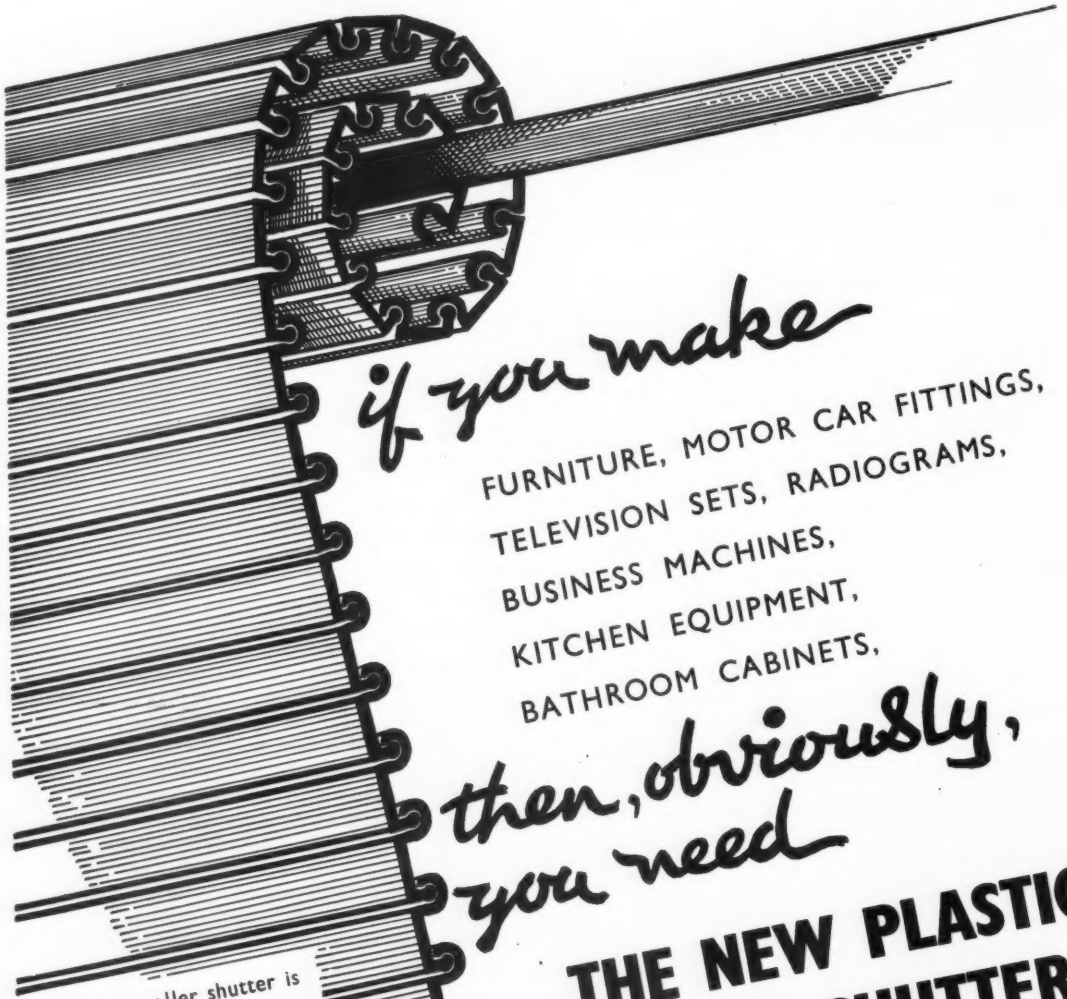


Polystyrene sheet for vacuum forming is manufactured on this plant at Ashdowns Ltd.



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NP 54

Plastics

VOL. XXII No. 237 JUNE, 1957

EDITORIALS

Common Trade Understanding

AT the recent annual conference of the Advertising Association, a recommendation was made to approach the Board of Trade to consider the adoption of the decimal system of currency and the metric system of measurement.

The number of times this important and urgent matter has been discussed by various technical and non-technical bodies throughout the country must be very great—and they have all been fruitless; we sincerely hope that the new proposal will have some success. The very fact that it has been made by the Advertising Association, a body that represents one of our most powerful and intelligent aids to trade, means quite clearly that we must no longer impose upon our overseas customers the irritating, infuriating burden of translating our own clumsy and irrational system. The poverty of our educational system in not making other languages part and parcel of our lives is bad enough (we have probably all seen the " Panorama " programme on television of May 27, in which three foreigners quite fruitlessly try and find their way about London by questioning passers-by in French, German and Italian) but to carry on trade, upon which our very existence depends, without a common trade language or common technical bond, must surely be the very height of folly.

We are at another cross-road in our history, and our new relationships with Europe in the mutual trade organization that is to be set up will probably prove the most difficult we have yet faced. Yet they should also prove, according to authority, the most fruitful for our future, which we must face with completely new methods and new comprehensions.

All British scientists and most technologists can use the metric system in their scientific and technical work, but rarely do so always. There is an astonishing mixture of working both in degrees Centigrade and Fahrenheit; we use " grammes " in chemistry but for large quantities never " kilogrammes " but pounds or tons; we use pounds per sq. in. for our energies and cannot readily translate them into kg/cm^2. How can we trade accurately and make money with our common measure of weight/volume in pounds per gallon when we should be stating specific gravity to a desired number of decimal points? We talk glibly of the fact that scientists all over the world understand one another, but even this is not quite true.

The change over with all our present standards would be a formidable task and has been the main argument against the change. But it can be done and in our opinion it must be done. What we want now above all things is that traders and technologists throughout the world should understand exactly what we mean, whether it is price or size, by a common denomination.

Harrogate Conference

IF there had been any pre-natal pangs of doubt as to the issue of the Third Reinforced Plastics Technical Conference held at Harrogate on May 1–3, they had certainly been dispersed even before its conclusion. It was a complete success and the British Plastics Federation is to be congratulated on the work of the special committee that organized it. If we may give our own views, they are that the papers read were of exceptionally high quality on the whole, that the numerous questions and the answers given to them were of equally high standard and very far from least, that the capability of the Chairman, Mr. W. Andrew Baker in his control and guidance at all times and in his summaries, earned him the admiration of all. We may add that the presence of the technical press, permitted for the first time, appeared to place no curb on the freedom of discussion—indeed, at times it seemed to stimulate it.

A statement to the Press by the Chairman on the eve of the Conference gave a clear indication of what we were to hear. " It has become increasingly apparent, over the last two years," he said, " that accurate design data and reliable manufacturing standards must be established if reinforced plastics materials are to realize their full potentialities for engineering structures. Whether it be cars, boats or aircraft components the requirements are the same—the basic raw materials, i.e. resins and reinforcements—must be consistent in their mechanical and physical properties and manufacturing techniques must be adopted which will ensure a satisfactory standard of strength and performance throughout the life of the part . . . . The Third Reinforced Plastics Technical Conference is aimed specifically at exposing the major issues confronting the industry at the present time and at determining the lines on which future research on raw materials, design and manufacturing processes should proceed to ensure progress on a sound engineering basis."

In effect the success of the Conference may be stated in another way: it has resulted in a much clearer picture of the whole problem and as Mr. Baker said, of the issues that lie ahead. We know more about the relative characteristics of the plastic reinforcements compared with some metals (the former are far from being always inferior), and we know that important work is being carried out on degradation. There seems to be emerging clearer demarcations of the limits obtainable with the various resins we employ and indeed as will be seen from the report reproduced elsewhere in this issue, the summary makes a somewhat clear-cut difference in type of application. This is probably correct today but there may be, as there usually are, changes on the way. So little is static.

Of greatest interest to moulders were those papers dealing with the actual technology of producing reinforced mouldings particularly by the matched moulding process by which so much excellent work is being produced. All such papers were full of guidance and welcome processing details.

We hope to publish some of the papers in forthcoming issues of this journal.

Wet Layup Problems

IT is strange that the wet layup process of making reinforced plastics received so little attention at the Harrogate Conference although it is by far the most widely employed. With the exception of Mr. F. Boydon's (Guy Motors Ltd.) excellent paper which dealt with planning, production and costing problems, little was said and almost nothing was discussed on the technical aspects.

We are reminded of an important conclusion arrived at in a

very different section of the reinforced plastics field—that of matched-metal die moulding—by Mr. C. Joseph in his very enlightening paper on the subject. " With some regret I must mention that the savings brought about by cheap tooling for mass produced mouldings has proved to be an illusion." Cannot we also say, with due respect to the human race, and also in respect of the wet layup process, that whereas some of the tools are cheap, the most expensive items are the men (or women) at the layup table. In our opinion they are, because of the present methods used, inevitably technically inefficient, and by all opinion and for the same reason, wasteful of resin.

Here surely is an opportunity for improving at least one aspect of the wet layup process, by making possible precise control on the resin used, and by virtually eliminating any wastage. We suggest that one possible method of doing this would be to employ a material based on Bentonite, to confer thixotropic characteristics. Whilst such an adulteration of the resin would permit the mix to be spread into the glass reinforcement by currently used methods, the mix would nevertheless be mechanically stable and would stay where it was put. Fall-out of resin, causing wastage, or concentration of resin, giving some areas with too much resin and some with too little, might well be eliminated.

A question on this subject was put at the Conference and the answer given by a representative of a resin manufacturer was that Bentonite materials had been tested three years ago, but had been discarded due to their interference with the cure cycle. It is to be regretted that the experiments were not continued, especially with newer versions of these materials which have very strong surface activity due to modification with long chain amines.

Moulding Powder and Shot

Quartz-Fibre Structures

Some time ago when the argument over strength of glass-fibre was raging fiercely, I began wondering whether quartz fibre, which has long been considered of a higher tensile strength and modulus of elasticity than glass, has ever been regarded as a replacement of glass as a resin reinforcement. I have never encountered anybody who has tried it and between you and me, very few people outside a narrow circle in the acid manufacturing industry know even the use of " solid " quartz. Quartz fibre has been known for many years, probably more than a hundred, and is used because of its high electrical insulating properties and in single strands for supporting mirrors in galvanometers because of its tensile strength. It has always been reported that it was originally produced " by shooting fused quartz with a bow and arrow " which must have been a very difficult technical problem. Today I presume production is analogous to that of making glass fibre. Generally speaking the elastic modulus appears to be higher than that for glass of the order of $7–10 \times 10^{11}$ dynes per sq. cm. compared with $5–6 \times 10^{11}$ dynes per sq. cm., and there is also a possibility that quartz fibre has the better wetting properties of the two. There is obviously no information on this point yet. There is only one manufacturer in this country, Thermal Syndicate Ltd., Wallsend-on-Tyne, and when I saw their representative at the recent Instruments, Electronic and Automation Exhibition, he told me that a fabric could not be made of it as the weaving was so difficult. But he fascinated me by showing me samples not only of the fibre but of quartz fibre wool, which to me seemed much finer and lighter than cotton wool. If this could be made in blanket form it might prove interesting as a reinforcement especially since large proportions of resin could be employed with consequent lowering of cost. I must warn anybody who gets excited about my idea that it is very, very expensive. Indeed I believe that the biggest order ever obtained (presumably from the electrical industry) was of the order of 25 lb. However, this must be due to the extraordinarily small market for it.

* * *

Bags of Money.

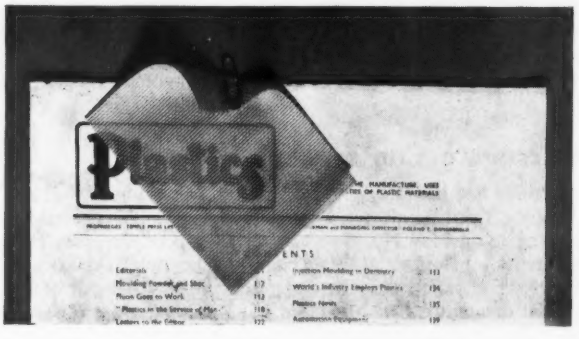
I have been asked by my bank manager (who has at last condescended to smile at me, presumably in the hope of getting some buckshee advice) whether there is a possibility of replacing the paper bags used for carrying silver and copper coins, by stronger, transparent plastic ones. The paper ones are pretty strong but because of rough handling, often burst open and the money has to be re-bagged and re-counted. Transparency would obviously speed up handling of bulk coin, but the big snag, as ever, would be cost. The paper bags are about one farthing each, and while, no doubt, the banks " would be prepared to pay more," could a plastic bag be made and sold even for a penny each? Still, while we're at it, let's consider the problem. The commonly used bags hold £5 worth of silver (weight 20 oz.) and 5s. worth of coppers (also 20 oz.). Wouldn't a p.v.c. or polythene bag stretch and burst under such a weight? Would Melinex (Terylene film), which we are told is 10 times stronger than polythene, be good enough? I'd plump for a nylon or Terylene fabric, say $\frac{3}{8}$ in. or more mesh, which would at least show what's in the bag. Closure would have to be considered carefully for the paper bag is simply folded and pressed down. A strong rubber band might be sufficient—a piece of p.v.c.-coated copper wire twisted round the neck certainly would.

* * *

P.V.C. Fabric Reinforced.

And what about the new p.v.c. reinforced with Terylene frabric now being made by B.X. Plastics Ltd.? Mr. MacDonald-Watson, of that company, has sent me along a sample of it, for a very different purpose it is true, but it is tremendously strong and, as you will see from the photograph I've had made, it's transparent enough for the job in question. Its main purpose in life at present is quite different—for the making of raincoats. It is quite clear, and I think every female of the species will agree, that the p.v.c. raincoat has been a heaven-sent boon to mankind—perfectly rainproof, low cost, exceptionally light and foldable to small capacity, it can be carried about in one's pocket or bag, everywhere and all the time, and makers have surpassed themselves with elegant shaping and the excellence and strength of buttonholes and buttons. The only snag of the normal p.v.c. sheet is tearability which the user cannot sew together or repair decently by welding. The new reinforced p.v.c. is an entirely different pair of shoes. As I say, it is almost untearable, but what is also important, a housewife could readily make up a garment herself by cutting and sewing from the sheet. So far as I can see, the material can be used for curtains and all other applications normally made from the non-reinforced type. I suppose the manufacturer would weld in the usual way.

DOGSBODDY.



Expansion in Plastics Coating

New developments in this branch of plastics technology, seen at Durable Plastics Ltd.

IN October, 1955, we published an account of dip moulding and coating processes carried out by Durable Plastics Ltd., who at that time had several buildings in Friary Square, Guildford. Just a year and a half later we had the pleasure of visiting the company's new factory on the Woodbridge Industrial Estate, Guildford, and in this short article we shall describe the great expansion that has taken place, not only in the business of Durable Plastics Ltd., but also in the whole field of coating metal with plastics.

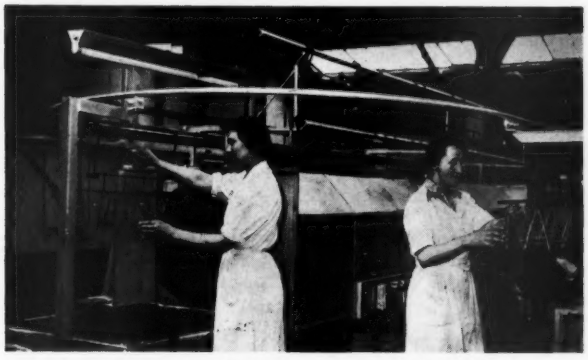


Fig. 1. Polythene coated components emerging from the infra-red tunnel.

With the advent of p.v.c., polythene, nylon and p.t.f.e., new horizons were opened up to the plastics industry in surface coating a massive variety of metal objects, ranging from wire woods to heavy steel components for chemical plant. The objects in so doing were two fold, first, to provide protection against corrosion of the metal and damage to articles coming into contact with the metal, and second, to improve the appearance of the structure to be coated. These objectives remain the same today, and in both aspects Durable Plastics have built up a large and thriving business. Notwithstanding the successes achieved so far, however, the company is continually examining new plastics compositions, designing new plant, and exploring new markets, for its management is convinced that great expansion is still possible, and that the market as a whole has, as yet, been only superficially covered.

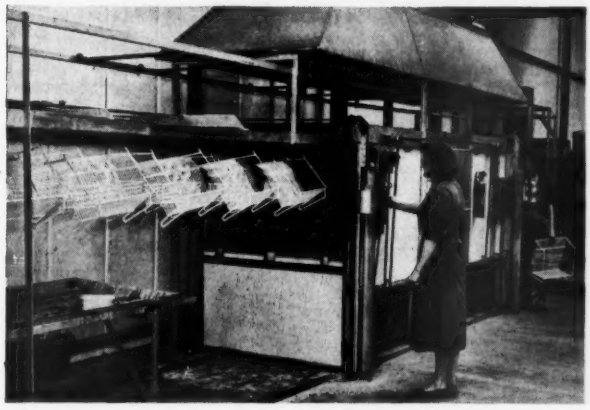


Fig. 2. P.v.c. coated plate racks entering the curing oven.

Automatic Machinery

The new factory at Guildford is specially interesting for the plant that has been designed and built there, much of which is automatic. For example, Fig. 1 shows metal components emerging from an infra-red tunnel, having been stoved to harden the polythene coating. This latter has been applied by continuous sintering apparatus. The articles, loaded on jigs, are quenched in the water bath seen adjacent to the tunnel. Operating the complete unit continuously, very high production rates are achieved.

Dip Coating

Similarly, p.v.c. dip coatings are carried out on a large scale, as seen in Fig. 2, where plate racks, having been dipped in the plastisol, are shown entering the automatically controlled curing oven. Suspension jigs for such large items need careful design if the surplus material is to be allowed to drip safely away, leaving a coating of uniform thickness. Some idea of the quantity of goods handled is conveyed by Fig. 3, where a section of the finished goods warehouse is shown. In the foreground are crates for use by milkmen; attractively coloured, they eliminate the noise of glass against bare metal, and reduce breakages. A closer view of the crates is given in Fig. 4. In the far left-hand

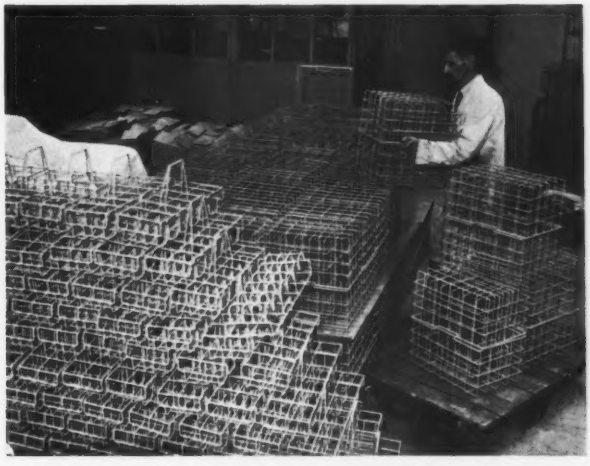


Fig. 3. General view of the finished goods warehouse. Milk crates in the foreground.

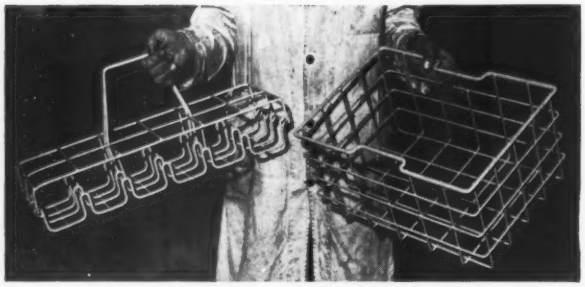


Fig. 4. Refrigerator crate and milk bottle holder.

corner of Fig. 3 can be seen stacks of wire sections, not yet coated, which will be made up into clothes-horses.

One of the newer developments in the coating technique is the glass bottle for aerosols. Developed primarily for pharmaceutical uses, where sterilization is important, the p.v.c. coated aerosol bottle also is finding applications in the general field, including cosmetics. Apart from the decorative finish imparted by the p.v.c., complete protection against glass splintering is afforded in the event of the bottle being dropped. Fig. 5 shows an end-on view of an automatic plant designed for this application, and again the productivity of the unit is very high.

In the dip moulding field many new outlets are being found, particularly in the automobile industry. Fig. 6 shows trimming of the ends of flexible coverings, which have been dip-moulded in p.v.c. Here too automatic plant is in operation, producing both large and small mouldings of considerable complexity, at very economical rates.

Chemical Applications

In the view of Durable Plastics, the biggest outlet for the experience gained by the company since it started four years ago lies in the technical field, where protection of surfaces against all kinds of corrosion is a major problem. For this reason, the company has devoted a great deal of time to the study of chemical and allied plant requirements, with the result that a whole new section of the factory is now concerned only with this type of work. A typical example is seen in Fig. 7, where an operator is flame spraying nylon to corrosion-proof a chemical vat. Techniques have also been devised for handling p.t.f.e. dispersions,

Fig. 6. Trimming the ends of dip mouldings fabricated from p.v.c.

Fig. 5. A view of the automatic plant for coating glass aerosol bottles with p.v.c.

again for corrosion resistance and high temperature work. Low pressure polythene is also being employed.

In the case of nylon, p.t.f.e., and low pressure polythene, separate techniques are of course required for each material. Whereas nylon can be flame sprayed, with great success, p.t.f.e. requires a film casting technique in order to give a void-free coating. Dispersions of p.t.f.e. are used, and frequently seven or eight successive castings are required on to the one surface to give a film of the requisite thickness. In the case of the low pressure polythene, sintering techniques of the kind already employed with the high pressure version permit high quality coatings to be made.

The fact that these techniques exist, however, and that commercial experience with them has been obtained, means that especially in the chemical field, many new applications for plastics coatings are now possible. This is specially true of p.t.f.e. coatings, for lining chemical reaction vessels, pipes carrying corrosive liquids and gases, pickling-vats and baskets, and drying trays.

From small beginnings, in the days when wire coating was the sole interest, to today's modern factory with its many different processes, lies the reflection of the coating industry as a whole. The future for plastics here is substantial.

Fig. 7. The operator is seen here flame spraying nylon on to a chemical vat.

B.I.P. Win Design Award

One of the twelve "Design of the Year" awards made recently by the Council of Industrial Design was awarded to W. R. Midwinter Ltd., who market a range of Melamine tableware, designed and moulded by the B.I.P. Group.

ON May 10, H.R.H. the Duke of Edinburgh presented certificates to the manufacturers of 12 products chosen for their outstanding design from 3,500 shown at the Design Centre during the first year. At the invitation of the Council of Industrial Design, the products were shown by a panel of judges which included Professor R. Y. Goodden and Mrs. Astrid Sampe.

The plastics industry was honoured by the selection of an entry by W. R. Midwinter Ltd., for one of the 12 certificates. The melamine tableware was designed by Mr. A. H. Woodfull and Mr. J. D. Vale, of the product design unit of British Industrial Plastics Ltd., and moulded for Midwinter by the Streetly Manufacturing Co., Ltd. *Plastics* staff photographers took the two photos shown here on the day of the presentation.

Mr. Woodfull joined the B.I.P. group as a designer in 1934 and formed the product design unit in 1951. His colleague Mr. Vale, who has also been with the group for some years, won the Horners Award Competition in 1953. They have been responsible for many brilliant design jobs and have considerably influenced the general improvement in design in plastics moulded articles.

(Above) Mr. W. R. Midwinter, Mr. John Vale and Mr. A. H. Woodfull.

(Left) Cups and saucers—part of the winning entry.

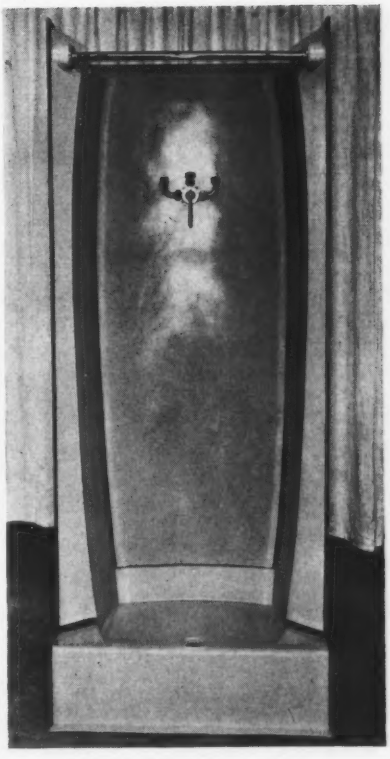
Designed for the Job

WE visited recently a relatively new company in the reinforced plastics industry, a company with an interesting beginning and with interesting ideas. Located at Woodbridge Road, Guildford, Martin Goacher & Co., Ltd., came into being largely as a result of the *News Chronicle* television contest last year, when £3,500 was offered to the most promising would-be company director. The panel of judges comprised Mr. Peter Masefield, Sir Frederic Hooper, Mr. Billy Butlin and Lady Isobel Barnett, and Mr. Edward Goacher was one of the four finalists. He did not win, but his ideas for a business in reinforced plastics so intrigued a number of viewers that finance was made available. Thus he and his partner, Mr. C. J. B. Wood, found themselves in business, having left Vickers-Armstrongs (Aircraft) Ltd. in June, 1956.

Today they have a small factory busily engaged on contracts for a number of companies, and the materials they handle include epoxy, polyester and polyurethane resins, the latter employed for foam cores.

The photo shown here is of a shower-bath cubicle, designed by Martin Goacher & Co. for Reinforced Plastic Developments, and designed also so that the best possible use is made of the material, a single layer of glass woven roving. After application of the pigmented gel coat to the mould, the woven roving is laid-up and impregnated with polyester resin. A wooden framework is moulded-in, and the strength of the structure is largely obtained by the curvature of the panels. Standing inside the cubicle, and pressing out, the panels are under tension and are therefore rigid. The result is a unit which can be linked together in rows, or employed singly, which is most attractive in appearance and workmanlike in performance.

The company is also engaged in moulded resin-glass couplings for concrete piping, a project that has involved considerable design work, together with the construction of special moulding equipment. It is hoped to evolve from this a fully automatic plant.



Polyester-glass shower cubicle.

Developments at Ashdowns

These notes were compiled following a recent visit to Ashdowns Ltd., St. Helens, to inspect the new factory and installations devoted to laminate and sheet materials.

IN 1936 H. E. Ashdowns (Birmingham) Ltd., a moulding company, became part of the Pilkington group. Over a three year period the plant and equipment was gradually transferred to St. Helens, and by 1939 the company, now called Ashdowns Ltd., was engaged in all fields of moulding on a very large scale. With the war came big expansions into the military field, and consequent experience in the fabrication of laminated materials and thermoplastic sheet. So great, in fact, was the demand for products in these comparatively specialized fields in the post-war years, that recently the company withdrew entirely from the compression and injection moulding of plastics powder to concentrate entirely on five specific fields:

1. Synthetic resin bonded laminates based on paper and cotton fabric, both in sheet and moulded form, and copper-coated laminates for printed circuits.
2. Glass fibre reinforced plastics in the form of matched metal die and contact mouldings, and hand-lay ups.
3. Polyester-glass roofing materials.
4. High impact polystyrene sheet manufacture.
5. Thermoplastic fabrication of sheet materials such as Perspex, p.v.c., high impact polystyrene, and cellulose acetate.

This complete reorganization has absorbed the available space in a new factory of 120,000 square feet, equipped with plant worth over £250,000, £100,000 of which has been purchased during the past 12 months. The technical press were invited recently to see the new plant, and the following notes, compiled during the visit, give some indication of the scope of the new developments.

Polystyrene Sheet

Production of the high impact styrene sheet is based on the polymer Styron 475 manufactured by Distrene Ltd. The manufacturing installation was built by the National Rubber Machinery Company of Akron, Ohio, to produce sheet up to 48 in. wide and in thicknesses ranging from .030 in. to .180 in. Marketed under the trade name Formene, the sheet is also vacuum formed by Ashdowns on three machines, one the Formvac unit manufactured by Hydro-Chemie Ltd., of Switzerland. On this equipment such units as refrigerator liners are made, having dimensions of 54 × 32 in. Polystyrene sheet is also fabricated by press and wrap forming.

Laminates

A key feature in the laminate section are two new horizontal impregnators built to the company's requirements by L. A. Mitchell Ltd., of Manchester, having high output capacities for impregnated papers and others. Another specially designed machine cuts the impregnated materials to the desired shape.

Adjacent to the impregnating plant is the press shop where laminates are moulded in presses ranging from 350 to 1,500 ton capacity. Also here is the Becker and van Hullen of Krefeld multi-daylight press for laminated board production. Equipped with an automatic loading device, the press has 10 daylights, producing boards 8 ft. × 4 ft., and temperature and pressure are electronically controlled.

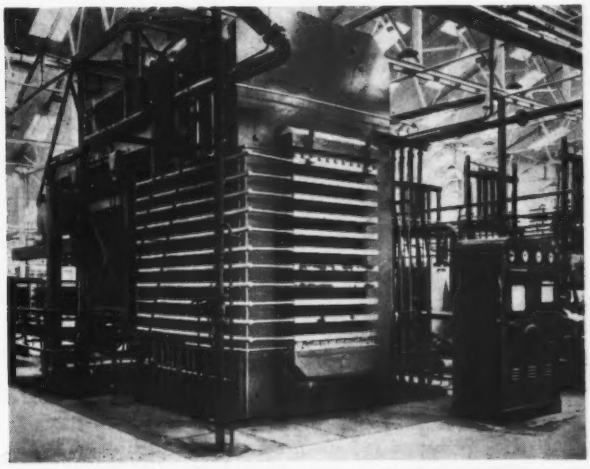
A specially important manufacturing process in this department is the coating of laminates with copper, carried out during production of the laminate. These materials are used for printed circuits, for which Ashdowns visualize a heavy demand, especially in the field of radio and television, where their use has resulted in price reduction.

Polyester-Glass Products

A large part of the work of the factory is devoted to matched metal die moulding using glass as the reinforcing medium, with resins of the polyester and epoxy type. For this work low pressure presses of capacities ranging from 20 to 500 tons are employed,

Glass-reinforced plastics department. Presses of various capacities are ranged in the background.

Horizontal impregnator for fabric and paper base laminates.



Multi-daylight press for laminate board manufacture.

together with ancillary equipment such as two Turner Atherton preforming machines, and specialized moulding plant.

A considerable amount of hand and semi-mechanical work is also carried out. In the department concerned, large scale hand lay-ups mouldings are made, and Ashdowns also have a special section for the production of corrugated translucent sheeting for roof lighting, having the trade name Undulite.

Other Facilities

Inspection is carried out on a two-stage basis. All products pass through a first-inspection area before being taken to the fabricating and finishing shops. On the far side of the latter is the final inspection area before products are moved into the warehouse.

Fabrication, which includes routing, spindling, sawing, milling, grinding, u/v curing, cementing, silk screen printing, and spraying is carried out in the area adjacent to the blanking and sanding department.

Laboratories have been installed, equipped to a very high standard, to handle testing, evaluation, and development work for the materials made or fabricated by Ashdowns. In the physical test laboratory both mechanical and electrical testing is carried out on all materials handled. For electrical work a 1,000 megacycle test rig is provided.

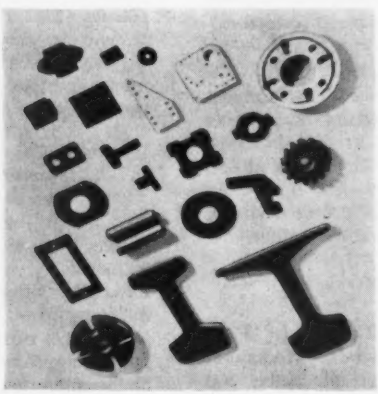
The factory is also equipped with a tool store where all current moulds, jigs and gauges are held.

As an extension of the work at St. Helens, Ashdowns have recently acquired Mendip Chemical Engineering Ltd., of Ashford, Middlesex, a company formed three years ago to develop the use of glass-reinforced plastics in chemical plant and equipment.

Main laminate department. Roof lighting is of Undulite polyester-glow material.

Mendip will continue to design and manufacture prototypes, while production quantities will be handled at St. Helens.

The photographs shown on these pages give some indication of the size and scope of this reorganization programme, embodied in the new factory. The productive capacity here is very large, and the clear specialization that Ashdowns have adopted will permit rapid progress to be made.



Examples of Ashdowns products. Left to right: typewriter case, engineering components, refrigerator liner.

The Coloration of Plastics by Irradiation—Part I

By S. H. PINNER,* B.Sc., Ph.D., and A. J. SWALLOW,* B.Sc., Ph.D.

HIGH energy radiation is beginning to prove very useful to the plastics industry. Radiation can cause polymerization, and offers many advantages over conventional methods. Another important reaction is the crosslinking or "vulcanization" of plastics, and this is already being exploited on a commercial scale. We have now conducted an experimental survey of the effect of radiation on the colour of dyed and pigmented plastics. We have found that in many cases very little radiation is needed to produce a marked change in colour, and due to the high penetrating power of radiation, the changes occur right inside the material. Several practical applications are envisaged including the use of radiation to provide a good and cheap method of printing patterns.

General

It was decided to irradiate only commercially-available plastics. The ready accessibility of such samples and the knowledge that the basic colour was stable, leaving only the radiation-produced colours to be tested, outweighed the disadvantage of uncertainty concerning the nature of the colorant. More than 400 specimens of coloured plastics have been irradiated with doses up to 20 Mrad.

In a preliminary survey, a sample of each plastic was cut in two and one piece irradiated with fast electrons from a 2 MeV, 0.5 kW Van de Graaff accelerator. Doses were given in steps from 0.5 Mrad upwards until the plastic showed a noticeable change in colour, but if there was no change by 14.5–17 Mrad the experiment was stopped. Irradiations were usually conducted over a period of a fortnight and sometimes up to two months.

TABLE I

COLOUR REVERSION OF IRRADIATED PERSPEX (1.5 Mrad)

Formula No.	Conditions	Distance of Colour Boundary from Cut Edge*			
		After 7 days	After 18 days	After 28 days	After 65 days
Amber 300	†Nitrogen, room temperature	0	0	0	0
Amber 300	Oxygen, room temperature	0.5	1.0	Clear	—
Amber 300	Air, room temperature	0.1	0.2	—	‡—
Red 400	Air, 54°	0.5	1.3	Clear	—

* Specimens were 3 mm. wide. Only distances less than 1.5 could be measured.
† Containing less than 10 p.p.m. oxygen.
‡ Required 107 days to move 1 mm.

No precautions were taken to exclude oxygen from the samples. The samples were re-examined between one and six months after the final irradiation. About half the samples irradiated showed no change in colour at either examination. It was noted that dark plastics showed less change in colour than light ones, merely because small changes in the *amount* of colour would be less noticeable. No black plastic has ever changed colour.

Plastics other than Polyvinyl Chloride

Transient changes

Transparent polymethyl methacrylate plastics (I.C.I. "Perspex" and "Diakon") generally became yellowish on irradiation, but several samples including Perspex red 400 and amber 300 and Diakon red 400 showed the strong darkening previously noted by Day and Stein (1). The colour changes were often quite striking and sometimes occurred with doses as low as 1.5 Mrad. Over a period of months the colour was observed to revert to the original round the edges. The manner of colour reversion strongly suggests that this was caused by the slow diffusion of oxygen into the specimen. This explanation was checked by exposing freshly cut irradiated specimens to different atmospheres (Table 1). It was found that the colour did not revert in the presence of nitrogen, and that the rate of colour boundary movement was roughly proportional to oxygen partial pressure. This confirmed the role of oxygen. Heating in an oven at 120° for an hour also caused reversion to the original colour in most cases, although a few pale samples were found to have faded. Opaque samples usually showed no change on irradiation.

The changes in colour were attributed by Day and Stein to the ejection of bound electrons by the radiation, the electrons becoming trapped either in the polymer structure or by suitable dyes. If trapped by dyes the colour reverts to the original through the reaction:—

$$Dye^- + 0_2 \longrightarrow (dye \ldots 0_2^-)$$

Chapiro (2) on the other hand attributes the colour changes to the presence of trapped free radicals. It does not seem possible to distinguish between the two explanations, and indeed there may be little real difference between them.

Many other plastics also showed transient changes on irradiation. Translucent urea-formaldehyde resin (B.I.P. "Beetle") showed a tendency to become grey-mauve with doses of 1.5–2 Mrad, but the original colour was regained after standing at room temperature for three months. On re-irradiation the colour changes once more. Several samples that had been darkened by treatment with a dose of 5 Mrad were heated for about 30 minutes at 120° C. The dark colour faded and the samples became only slightly different from the original. If we interpret the results in terms of electron trapping, then as irradiation caused all the samples to change in the same way, the electron trap cannot be any particular colorant, but must be an acceptor present in every sample. The electrons are not firmly held in the trap, and are able to return to their original position by a purely thermal process.

Nylon (I.C.I. "Maranyl") tended towards brown-yellow on irradiation with low doses. Samples which had been given 15 Mrad were heated at 120° and the yellow colour was found to reach a minimum within one hour. Casein formaldehyde plastics (B.X. Plastics, "Lactoid") turned towards yellow in many cases, the change being partly reversible on heating. Cast phenolic resins (Catalin) also showed transient effects; one scarlet sample, 459, showing a particularly marked effect, becoming deep maroon with only 0.5 Mrad.

Permanent Changes

Urea formaldehyde resins that had been given 15 Mrads and then heated to 120° for one hour to remove the transient colour were found to be appreciably more brown-yellow than before irradiation. A scarlet sample of cellulose-filled urea-formaldehyde resin (B.I.P.) showed a pronounced irreversible darkening with 1–3 Mrad. Three light coloured cellulose-filled melamine-formaldehyde materials (B.I.P.) also showed irreversible effects with 1–3 Mrad. These filled materials showed a mottled appearance after irradiation, probably due to a normally undetectable inhomogeneity in the original material.

Only three cast phenolic resin samples showed no permanent

* Tube Investments Research Laboratories.

change with 15 Mrad (Catalin 459—dark brown, 803—transparent red, and 962—ginger). Other samples changed slightly towards yellow. Nylon samples showed only a slight permanent yellow shade after 15 Mrad. Casein-formaldehyde plastics (B.X. Plastics, " Lactoid ") showed a slight change, usually a tendency to turn towards yellow with doses of 5.5–8.5 Mrad, but several specimens, especially the darker ones, showed no change. A few of the Lactoid samples (including pink, blue, maroon, ginger) showed a fading of colour.

The permanent changes fall into two groups: those due to decomposition of the base material and those due to an effect on the colorant, the former causing the material to become brown or yellow.

Stable Plastics

Many plastics showed little change on irradiation, and this must often be due to the masking of small changes by relatively large amounts of colorant. Polythene plastics (I.C.I. "Alkathene ") for example, showed no colour change, although an uncoloured sample " Natural 9000 " tended to yellow with a dose of 17 Mrad. Toughened polystyrene (R. H. Cole styrene-butadiene copolymer) remained unaffected by radiation, the only exception being a blue sample " 8 K013 " which became rather lighter with a tendency towards yellow on irradiation with 16 Mrad. Cellulose secondary acetate samples (B.X. Plastics " Bexoid ") were largely unaffected. Exceptions were three samples, one deep beige (B 3231) and two blue-green (B 3202 and B 3235) which showed a moderate tendency to turn in the direction of brown with 15.5 Mrad. A more remarkable exception was a pink sample (B 3191) which lost much of its colour with only 3.5 Mrad. Most cellulose nitrate samples (B.X. Plastics " Xylonite ") were unaffected, but six light samples (F 9664 opaque pale blue, F 25829 opaque beige, F 22643 opaque apple green, F 9544 opaque pink, F 9621 opaque white, F 9665 translucent white) turned towards yellow with 15.5 Mrad, the change being particularly marked with the translucent white sample.

Plastics Containing Polyvinyl Chloride

From a commercial point of view, perhaps the most valuable results are those on polyvinyl chloride. Tables 2 and 3 show the final effects obtained. The vinyl chloride homopolymer (I.C.I. " Darvic ") turned towards brown on irradiation, while the vinyl chloride-vinylidene chloride copolymer (B.X. Plastics " Cobex ") turned towards grey. Only black or very dark samples showed no change. There was little or no change in the physical properties of the materials at this dose level, and in particular the tensile strength of Darvic samples showed no significant change with doses less than 15–20 Mrad (Table 4).

Examination of Cobex samples immediately after irradiation showed that two types of colour effect are present together. One effect is a transient one due to electron trapping or trapped free radicals and with Cobex shows as a blue tinge in the material, independent of the original colour: the other effect is caused by a decomposition of the base material not unlike that produced by prolonged exposure to strong ultra-violet light. Several

TABLE 2—COLOUR CHANGES IN DARVIC SAMPLES

Formula No.	Initial Colour	Dose (Mrad)	Final Colour
110	Natural	2.5	*Deep amber
410	Opaque red	4.5	†Dark red
770	Opaque pale blue	4.5	†Grey
015	Opaque blue white	4.5	†Yellow
010	Opaque white	4.5	†Slight yellow
225	Opaque yellow	7.5	†Mustard
446	Opaque pink	16.5	†Brown
550	Opaque brown	16.5	†Dark brown
115	Opaque cream	16.5	†Beige
661	Opaque pale green	16.5	†Grey-green

* Signifies marked change.
† Signifies moderate change.

TABLE 3—COLOUR CHANGES IN COBEX SAMPLES

Formula No.	Initial Colour	Dose (Mrad)	Final Colour
5046	Opaque pale blue	2.5	†Grey
5023	Opaque orange	2.5	†Mustard
5036	Opaque apple green	2.5	*Grey-green
5031	Opaque green	6.5	†Dark green
5072	Opaque cream	6.5	†Dark yellow
5073	Opaque cream	6.5	†Grey
5043	Opaque pale blue	6.5	†Grey
5004	Opaque pink	6.5	*Grey
5016	Opaque pink	6.5	*Grey
5065	Opaque white	6.5	*Grey
5098	Opaque grey	15.5	†Dark grey
5025	Opaque yellow	15.5	*Stone
5095	Opaque grey-brown	15.5	*Dark grey
5091	Black	15.5	No change
5047	Opaque blue	15.5	*Grey
5001	Opaque beige	15.5	†Maroon
5112	Opaque brown	15.5	†Red-brown
5049	Opaque brown	15.5	†Red-brown

* Signifies marked change. † Signifies moderate change.

irradiated originally white samples have been heated for a few minutes in an oven at 120°. The blue colour did not diminish appreciably, but the base material darkened further. The effect of ultra-violet light of wavelength 2537 Å on an irradiated Cobex sample was to cause the blue colour to disappear. This can be explained by the release of trapped electrons from a metastable position (3). At the same time ultra-violet light produces a further effect on the base material so that subsequent heating caused it to darken much more than samples which had been irradiated with electrons, but had not been subjected to ultra-violet light. Samples which are exposed to daylight or artificial light lose their blue tinge after a few weeks, but the darkening

TABLE 4—TENSILE STRENGTH OF IRRADIATED* DARVIC

Dose in megarad	Tensile Strength in p.s.i.†	
	Room Temperature	100° C.
1	7,810	1,140
2	7,570	1,475
4	7,700	1,120
6	7,880	1,530
8	8,000	1,480
10	7,630	1,370
15	7,520	1,700
20	7,760	2,500

* Van de Graaff electron irradiation at room temperature.
† Measured according to B.S.S. 903 C using a Hounsfield Tensometer at a strain rate of 2 in. per minute.

of the base material persists, and presumably would tend to become more marked with time. This increased darkening at room temperature has not been noted in our qualitative experiments with Cobex, but several different coloured transparent samples of plasticized polyvinyl chloride (I.C.I. " Welvic ") which showed only a moderate darkening on irradiation with 14 Mrad had become an almost opaque maroon after three months.

We have noted that when Cobex samples are partly screened with lead during irradiation, a slight yellow coloration sometimes develops at the boundary between the irradiated and non-irradiated portions. We cannot yet advance any explanation of the phenomenon, but it is very slight compared with the other changes.

References

1. M. J. Day and G. Stein, *Nature*, 1951, **168**, 644.
2. A. Chapiro, *J. Chim. Phys.*, 1956, **53**, 295.
3. G. Stein, *J. Chim. Phys.*, 1954, **51**, 133.

(*To be concluded in the July issue*)

The British Industries Fair

INTEREST in this year's B.I.F. has perhaps been overshadowed by the many specialized industrial exhibitions, *e.g.* Instruments and Automation, Plastics, Business Equipment, and many others. It is not surprising therefore to find the Plastics Industry thinly represented at Birmingham.

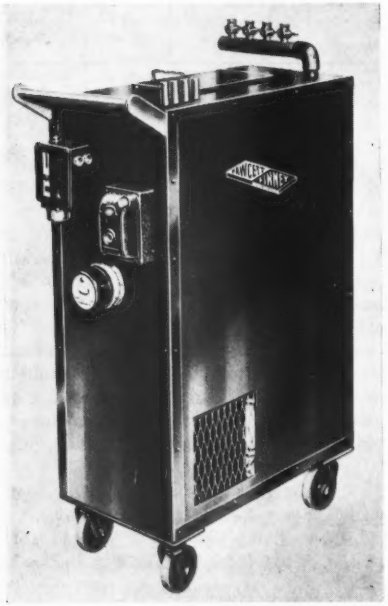
Fabrications

Mouldings and fabrications were principally confined to domestic and hardware although Plastic Engineers Ltd. were exhibiting many excellent examples of nylon mouldings for industrial applications. On the stand of United Ebonite and Lorival Ltd. were a further selection of custom mouldings in wide range of materials but the principle exhibit was a liquid depolymerized rubber, known as Lorival R which this company have developed. On the fabricating side Tufnol Ltd., showed many examples of the use of their laminates in different industries and utilizing different properties. Matthews and Yates Ltd. were exhibiting for the first time their range of Turbro-Cyclone p.v.c. fans for use in fume removal ducting. On the stand of F. H. Bourner & Co. (Engineers) Ltd. was a display of polythene tubing extruded by the Delta Metal Co. Ltd. This tubing we understand is made from the Zeigler low pressure polythene and high tensile strength—3,000 p.s.i.—is claimed for it. Also exhibited with the tubing were the Plastex compression fittings especially designed for use with plastics tubing.

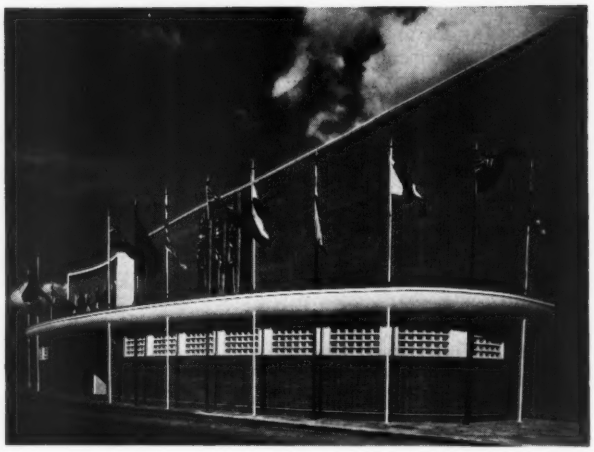
Machinery

Two Daniels Latymer vacuum forming machines were on show and being demonstrated to potential customers. These were the 40/40 fully automatic machine for drape or vacuum forming and a smaller model for the production of blister packs from roll film.

Fawcett-Finney Ltd., showed a variety of equipment for the plastics and rubber industry including a complete rubber extrusion line and also the Davis-Standard cable covering extruder and equipment. (See *Plastics*, June, 1956). Their new exhibits included the Osborn Hopper Loader details of which appeared in *Plastics*, Dec., 1956, p. 346, and The Osborn Heating Unit. This latter is designed for the heat control of injection moulds and consists of a self-contained water circulating unit incorporating immersion heaters, thermostats, and a cooling fan. Other machinery included the Finney 50-ton down-stroking pre-filling semi-automatic compression press and a 10-ton laboratory press. Both these presses were fitted with Greer-Mercier hydro-pneumatic accumulators.



The Osborn heating unit shown by Fawcett-Finney Ltd. for use in controlling the temperature of injection moulds.



Mixing machines were the principle exhibits of Wm. Gardner & Sons (Gloucester) Ltd., and among these were the double cone mixers with a special attachment for controlling the lateral displacement of the raw material.

Somewhat smaller in size but nevertheless creating considerable interest were the Elwas-Discut machines shown by Printac Ltd. These are disc filing and trimming machines which operate with equal facility on aluminium alloys, wood, plastics and a host of other material notorious for their file clogging properties.

Raw Materials

Most interesting exhibit on the raw material side was a new product of the Development Division of Dunlop Rubber Co. Ltd. called Duthane. This material is reported as being produced from a controlled reaction between isocyanates and other organic materials. A considerable range of similar materials with varied characteristics can be produced. These can be seen from the following table.

PHYSICAL PROPERTIES

Specific Gravity	1.225—1.275
Hardness BSD	80—95
Tensile Strength lb./sq. in.	4,000—6,000
300% Modulus lb./sq. in.	1,500—3,000
Elongation at Break %	600—750
Tear Resistance lb./in.	600—1,000
Abrasion Resistance	up to 5 times that of rubber tread stock

These properties remain substantially unaltered from —20° C. to 120° C.

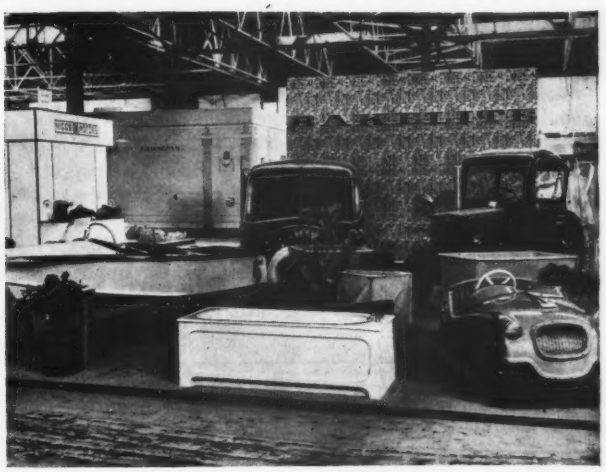
I.C.I. Plastics Division gave prominence to two of their recent developments. These were the Butakon rubber reinforcing resins which are copolymers of butadiene and styrene, and Melinex polyester film where attention was drawn to its suitability as a packaging film.

A display of applications of the use of glass reinforced polyester resins and a wide range of exhibits manufactured from Bakelite moulding powders and resins exemplified the position this company holds in the plastics industry.

(Below) The stand of I.C.I. Plastics Division.

(Above) The stand of United Ebonite & Lorival Ltd.

(Below) Plastics fabricating machinery on the stand of Fawcett Finney Ltd.



(Above) Some glass reinforced plastic mouldings shown by Bakelite Ltd.

(Left) The 40/40 Daniels/ Latymer vacuum forming machine.

(Right) Nylon mouldings shown by Plastic Engineers Ltd.

Reinforced Plastics Conference

A report on the papers and discussions at the recent Harrogate Conference. Certain of the papers presented will be published in forthcoming issues of "Plastics"

ONE HUNDRED AND FORTY representatives of the reinforced plastics industry converged on Harrogate on May 1 for the opening session of the British Plastics Federation conference on reinforced plastics. All the delegates were accommodated at the Old Swan Hotel, where the three-day conference was also held. Mr. W. A. Baker, of Bristol Aircraft Ltd., was in the chair.

The titles and brief summaries of papers delivered were published in the May issue of *Plastics*, page 156. The procedure of the conference was to take the papers as read (pre-prints having been circulated), leaving each speaker approximately 20 minutes to summarize his views, amplified by slides if necessary. This permitted a much fuller discussion than would otherwise have been possible.

In compiling the report which follows, the object has been to highlight the specially important conclusions of the conference, relating these to the various papers read. It is gratifying to point out here that the 1957 conference may well mark the turning point of the reinforced plastics industry, for the good reason that the climate of the conference was one of frankness, with a full exchange of factual information. The old concept of "reinforced plastics—right on wrong" has been discarded in favour of the more practical approach, and the willingness of delegates to note faults, as well as virtues, in the materials, is an encouraging sign.

* * *

Wednesday, Morning Session. Material Properties

After a few opening remarks by Mr. W. A. Baker, who welcomed the delegates, Mr. H. A. Collison, chairman of the Federation's Main Technical Committee, restated the terms of reference of the Reinforced Plastics Committee. He emphasized that the Committee had wide powers, and that no effort should be spared to press ahead on all fronts to get the reinforced plastics industry moving.

Mr. W. Andrew Baker, who chaired the conference, joined Bristol Aircraft Ltd., in 1946. He is now Deputy Chief Development Engineer (Plastics), and he is also chairman of the reinforced plastics committee of the British Plastics Federation.

Professor R. D. Ritchie then came up to the rostrum, to discuss his paper on the thermal decomposition of polyester systems, and in a typically breezy manner announced "those who are interested in my paper will have read it—those who haven't, aren't. Any questions." He got them, and in so doing unconsciously emphasized a curious feature of the conference—to whit that an altogether unbalanced emphasis was given to heat resistance and heat degradation. Important though this problem is, possibly the majority of applications for reinforced plastics are untrammelled by heat resistance requirements except in the case of certain chemical plant. It thus served to underline the residual bias to aircraft applications that remains today, notwithstanding the strictly limited market that exists therein.

Professor Ritchie was followed by Mr. E. W. Russell, of the R.A.E., whose paper dealt with the development of heat resistant laminates and laminating resins, Mr. A. de Dani, of Fibreglass Ltd., who described an investigation into chemical finishes for glass fabrics, and Mr. W. J. Reed, of Bakelite Ltd., who described the effect of heat on the flexural strength of fabric-filled laminates

There then followed a break for coffee, followed by a discussion, with all the morning session speakers on the platform. Mr. Baker, an admirable chairman, collected together the salient points emerging from the four papers. These were that polyester structures appear to have a threshold temperature of 310-360° C., which seems to impose a limiting factor where high temperature resistance is a design factor, that developments in new finishes to glass may have a profound effect upon properties, and that strain is likewise a fundamental factor governing properties.

On the question of finishes, Mr. de Dani gave attention to N.O.L., a special preparation of the Naval Ordnance Laboratory of America. Following disclosure of the formula, a number of companies have been preparing this finish in Britain for their own requirements. It seems that the N.O.L. finish, a condensation product of alkyl trichlorsilane and resorcinol, is a superior finish to most of the others available, although its unstable characteristics (it polymerizes to a useless solid state in three days), may prevent its commercial adoption.

Another delegate suggested that better quality phenolic resins were available in the U.S. than in Britain for reinforced plastics. This led to a general discussion on the catalysis of phenolics, in which it emerged that the type of catalyst used influences the thermal and strength characteristics of the laminate. This was a surprisingly unscientific observation, having in mind the vast amount of research down the years on the phenolic-aldehyde reaction and the effect upon this of the catalyst and manufacturing conditions. The discussion on ammonia catalysts was however useful, and brought from Mr. L. H. Vaughan, Bakelite Ltd., the announcement that a new range of phenolic resins were under development by his company. On the question of ammonia catalysts, he said that this use had a complex effect upon the resin, and that he did not believe that caustic soda was necessarily a better catalyst than ammonia.

Professor Ritchie was asked whether he could say, as a result of his work at the Royal Technical College at Glasgow, that breakdown in the polyester system due to heat occurred in the ester chain or at the junction of the ester chain and the vinyl linkage. His answer was that the degradation was commonly located in the unsaturated acid residue areas. It was a pity that this line of inquiry was not further followed up, because here may well lie a prime clue to the lack of uniformity in product associated with cold-cured polyester structures, viz. the random distribution of degree of cure. As long as unsaturated residues exist, the rapid degradation due to heat that is noted may well be only a dramatic representation of a more subtle, slowly occurring degradation, at ambient temperatures.

The only comment on this aspect of Professor Ritchie's work came from Mr. M. D. Curwen, *Plastics*, who referred to the work of Dr. Bowles, and the general question of activators of the metallic soap series, some of which act as flocculating agents, others as deflocculating agents. He wanted to know if the type

of degradation noted by Professor Ritchie could be inhibited, or at least decreased, by incorporating soaps of the flocculating type, or of mixed characteristics. Professor Ritchie answered that all the Royal College's work had been carried out in the gas phase, and as a result any orienting effect conferred by the activator would in fact be nullified. It is sad to note here that in this particular aspect of the polyester system, remarkably little work has been published on the function and part played by the activator, whereas very full investigations have been made into the action of the peroxy catalysts. This in the face of long-standing experience in the alkyd surface coating field, where oxygen is acknowledged to be of transient value, for after assisting the cure of the film, it functions as a continually active degradation agent.

Mr. H. Williams, of British Resin Products Ltd., asked Professor Ritchie if his work had been carried out in an oxygen-free atmosphere. The answer was no, although the oxygen present was probably very small.

Mr. D. S. Stephens, Ashdowns Ltd., directed an observation to Mr. de Dani, to the effect that the ratio of resin to glass had a considerable influence on the finish of a product.

At the conclusion of the morning session, delegates were free until the evening session, the afternoon being available for individual discussions. A free afternoon was also arranged for Thursday and this procedure seemed to be generally welcomed by the delegates.

* * *

Wednesday, Evening Session. Material Development

Mr. B. Parkyn, Scott Bader and Co. Ltd., opened the session with his paper on the raw materials for polyester resins. This was followed by a short lecture by Mr. J. E. Gordon, Tube Investments Ltd., on the strength of crystals, amplified by a film taken at Hinxton Hall, showing the growth of crystals in solutions, and demonstrating the immense flexural strength of simple crystal structures. Both lecture and film were brilliant. How satisfying to hear the true scientist describe as " an enormous distance " the fairly small dimension of one centimetre when referring to a crystal of Epsom Salts!

Although perhaps too fundamental for what was essentially a technological conference, Mr. Gordon's paper served the useful purpose of taking the technologists present one stage back, to a consideration of the basic problems. From these investigations may come developments of far-reaching importance and certainly a great deal of information on the properties of certain structures.

Dr. G. S. Learmonth, of Turner Brothers Asbestos Co. Ltd., presented a valuable and exceedingly well prepared paper on asbestos reinforced plastics. He was followed by Mr. H. Williams, who discussed some aspects of low pressure laminating resins.

The discussion that followed these papers was not as stimulating as that following the morning session, although a brilliant dialogue between Mr. Gordon and Professor Ritchie would have been worth tape-recording. The former's paper excepted, the remainder were not of a type calculated to spark controversy, although Dr. Learmonth's paper should help to focus attention in the practical value of asbestos reinforcements. A restatement of this material's virtues was timely, for so much work had hitherto been directed to purely aircraft applications as to overshadow completely the run-of-the-mill applications of the general type.

* * *

Thursday, Morning Session. Production Processes and Inspection

The first paper to be presented was that of Mr. C. Joseph, Ashdowns Ltd., on the matched metal die moulding of chopped glass fibres. His audience positively hung on his words, for his printed address could well serve as a *vade mecum* for all proposing to work in this field. In particular, his comments on mould design alone were, for the matched die moulders, worth the trip to Harrogate. For the production of quality mouldings he stressed the following points: (*a*) the mould should cut off the " flash " fibres cleanly; (*b*) trapped air must be permitted to escape; (*c*) at a certain point the tool must seal off the moulding, to prevent resin exudation.

He was followed by Mr. J. Rees, Bristol Aeroplane Co. Ltd., who reported progress on his much discussed injection moulding technique. Now being carried into the automatic stage, and remote controlled at that, the process as he described it may well be the blue-print for the production of large reinforced plastics structures of the future.

Mr. M. Lewin and Mr. R. Aylieff, of Thermo-Plastics Ltd., presented a paper on dough moulding. This was a valuable contribution to the conference. The following table of properties presented by Mr. Lewin is of special interest.

PROPERTIES—GLASS FIBRE DOUGH

	Phenolic/Glass	Polyester/Glass
Impact Strength (ft./lb.)	4–6	3–6
Tensile Strength (lb./sq. in.)	7,000–9,000	6,000–8,500
Bulk Factor	12–17	8–12
Specific Gravity	1.75	1.7
Water Absorption (MGM)	50–80	100
Electric Strength (Volts/Mil.)	150–250 (@ 90° C.)	230–350 (@ 100° C.)
Blister Temperature °C.	170–185	150–200

Whilst the phenolic-glass structures are superior in impact and tensile strength, the polyester-glass lead in electrical strength and blister temperature.

Then came papers by Mr. H. P. Martin, of Flexo Plywood Industries Ltd., dealing with autoclave moulding, and Mr. F. Boydon, Guy Motors Ltd., on hand lay-up moulding. Both were valuable in that they were strictly representative of consumer industries. Mr. Martin presented some valuable data resulting from experience with the autoclave technique. The following table will serve to indicate the valuable bridge that autoclave moulding constitutes between vacuum and matched metal die moulding.

Process used	Curing Pressures	U.T.S.	E.x.10^6	Specific Gravity
	p.s.i.	p.s.i.		
Vacuum	Not over 14	10,000	1.8	1.20
Autoclave	100	28,000	3.1	1.55
Matched Moulding ...	500	29,000	3.3	1.75

Mr. Boydon was more concerned with workshop practice and procedure than Mr. Martin, and his report on the methods employed by Guy Motors underlined the necessity for careful control of all processes if the hand lay-up technique is to be successful. " Do-it-yourself " and " bucket-and-brush " methods were, by inference, consigned to the dustbin.

The last paper of the morning session was contributed by Dr. J. H. Martin, Ministry of Supply. Dr. Martin was able to shed a little further light, in his address on the inspection of polyester-glass structures, on the question discussed earlier by Professor Ritchie and Mr. Curwen, namely the degradation factor. In referring to the very rapid resin erosion noted in certain weathering tests, he suggested that such erosion was apparently confined to cold-cured structures, thus emphasizing the importance of resin cure.

Dr. Martin's paper was most carefully prepared, and it was disappointing to note that he could not suggest any practicable method of inspection which, simply put, would tell the moulder whether or not his product was fully impregnated, fully cured, and free of voids. On this point, satisfactory answers to the many problems are not yet in sight, despite the fact that if reinforced plastics are to be accepted by industry in general,

practical methods of test will be of first priority. If it is to be left to time to answer these questions, the reinforced plastics industry may well be dead before the answers are known.

The discussion which followed these papers was vigorous, and the chairman had difficulty in closing the session in time for lunch. One of the most interesting facts to emerge was the statement, by Mr. H. V. Blake, Fibreglass Ltd., that in the U.S.A. the following figures were reported:

	Polyesters for Dough Moulds	Polyesters for hand lay-up
1956	10%	90%
1957	15%	85%

Mr. Curwen suggested the use of Bentonite or its modern modification Bentone to improve the properties of laminates. Here, he said, was the possibility of securing more uniform strength products, in addition to low loss of resin on the lay-up table or former.

Mr. P. Albericci, A. V. Roe and Co., Ltd., defended the hand lay-up technique, and refuted that it was only suitable for low quality products, this in answer to another delegate's observations.

* * *

Thursday, Evening Session. Engineering Design

Mr. A. W. Thompson, Bristol Aircraft Ltd., opened this session with his paper on the fatigue and creep properties of plastics laminates. Comprising essentially a report on a major investigational programme at Bristol, the object was to find out if plastics structures could offer superior fatigue properties to aluminium alloys. From the standpoint of a scientific approach to material properties, this paper may be said to represent the high water mark of the conference. Taken in conjunction with earlier work at the Forest Products Research Laboratory of America, it offers an invaluable commentary on this most important aspect of laminates.

Mr. Thompson suggested that the figures obtained justified the continuance of the investigation, and that reinforced plastics clearly had a great future in applications where weight and fatigue strength were of great importance.

He was followed by Mr. A. Wilson, Bristol Aeroplane Co., Ltd., who discussed his paper on reinforced plastics pressure vessels. This again was an admirable piece of work, excellently prepared. Probably the most complete report on a specific application yet published, the paper was fully supplemented by worked examples.

The last paper in this session was by Mr. R. J. Schliekelmann, of the Royal Netherlands Aircraft Factory. He described the extensive use of reinforced plastics in the new Dutch " Friendship " airliner. One important point he made was that despite the difference in material cost of 10s. per lb. vis-à-vis light-alloy and reinforced plastics, the Dutch had been able to employ the latter with economy, due to resultant savings in production costs. Approximately 1,000 lb. of reinforced plastics were being used in the " Friendship," which had a total unladen weight of 21,000 lb.

In the ensuing discussion, Mr. Schliekelmann was asked which resins he saw the greatest future for in aircraft structures, polyester or epoxy. His answer was that both should be used, since each had special properties.

Mr. C. W. Welch, *Plastics*, referred to work recently carried out on the tensile strength of various cold-cured polyester resins, employing metallic soaps known to have a flocculating effect. Stressing that the investigation was very much of a tentative nature, he asked the conference to note the apparent peak strength of polyesters activated with cobalt naphthenate, coinciding with apparent completion of cure, followed by loss in tensile strength, compared with more favourable effect of vanadium naphthenate. The reaction to this contribution suggested that the surmise made earlier in this report was true—viz. that investigations into activators had not kept pace with those into catalysts.

* * *

Friday. Health Aspect

Dr. E. E. Lieber, Medical Officer to Microcell Ltd., read a paper on the medical aspect of reinforced plastics manufacture, in which he described the medical supervision carried out by his company. Amongst several other questions, he was asked by Mr. Curwen, about the effect of styrene on women in pregnancy, since that of benzene vapour was reported on by the International Labour Office's Report of the 1920's. Dr. Lieber answered that subsequent investigation suggested that benzene was not of harmful effect in this respect.

* * *

The Chairman's Summary

Mr. W. A. Baker then summed up. First, he suggested that the conference had indicated that of the two main types of resin available, polyester and epoxy, the former had the wider field of application at lower cost, whereas the latter, having superior properties in all except shock, would find application in the high performance structures, where the higher cost could be justified. He stressed that fatigue properties were tremendously important for all engineering applications.

Under specific headings, he remarked as follows:

Properties. Reinforced plastics held immense advantages over metals—even steel—where strength/weight considerations were involved, and particularly vis-à-vis aluminium alloys in the case of notch strength. Stress concentrations were of less importance than in the case of light alloys.

Chemical resistance and weathering properties could define large markets for reinforced plastics, such as in shipbuilding to combat corrosion, and in railways, general building, etc.

Cost. The right material must be used for the right job. He highlighted the possibilities of the injection moulding process and Mr. Lewin's paper on dough moulding. He also referred to an earlier suggestion by Mr. Pentz, Leicester, Lovell and Co., Ltd., that an investigation be made into cost relationships, tooling, labour, materials, etc., and coupled this with the valuable information contained in Mr. Schliekelmann's paper on using the correct material in the most economical way.

Reinforcements. He suggested a second look at the available reinforcing materials, pointing out that due to past efforts to meet requirements of the Ministry of Supply and the Aircraft industry, we had thoroughly investigated only asbestos and glass. We should look again at flax, cotton, and other fibres.

Testing. He underlined the conclusions of Dr. Martin's paper, that inspection and test methods needed still more consideration.

Mr. Baker then stressed perhaps the most important point to emerge from the conference, i.e. that some method would have to be found to bring the fabricators of reinforced plastics into contact with the vast mass of data now available on materials, methods and applications. He stressed in particular the needs of the smaller fabricator and said that in harnessing the available knowledge quickly lay possibly the success of the reinforced plastics industry. At the moment there was an immense gulf between this pool of information and the fabricator.

His suggestions for positive action were:

(1) Discussions on extending the scope of membership of the Federation to bring in the small fabricators.

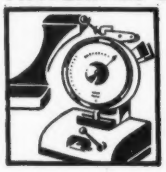
(2) The setting up of a small working committee to receive enquiries for information from fabricators and to circulate them to those who could supply the answers.

(3) To press ahead with Mr. Pentz's suggestion on costs investigation.

(4) To consider the possibility of an information bureau.

World's Industry Employs Plastics

MATERIALS and TESTING



Aluminium — plastic mixture. — By mixing aluminium with various plastics in appropriate quantities, marked improvements can be effected in the mechanical properties of the plastic, especially as regards impact strength. In order to obtain the desired results, it is essential that the plastic should "wet" and adhere to the aluminium and that it should not react chemically. The metal particles constituting the addition must have dimensions not smaller than 0.17 mm. and it is preferable if the particle size of the metal addition be above 0.14 mm. In most cases the best results are obtained with metal particles of dimensions 0.3 to 1.5 mm. With polystyrene an impact strength of 4 cm.kg/cm² can be achieved with comparatively coarse aluminium particles up to a volume in addition of 32.4%. The product has a softening point of about 6° C. higher than plain polystyrene. Data are also given for aluminium addition to phenolic resins. Aluminium-plastic composites are not subject to accumulation of static charges. They may under appropriate conditions be injection moulded and may be machined readily. They may also be produced in a porous form.
(*Revue de l'Aluminium*, 1956/Dec./1165.)

Radiation protection.—An account in Russian on the adaption of p.v.c.-base materials for personal protection against harmful radiation. The authors discuss *inter alia* an addition to p.v.c. of various inorganic materials opaque to different types of radiation and give data on the efficiency of these. The use of alkaline-earth stearates, for example, barium stearate, is noted.
(*Khimic'eskaya Promyshlennost*, 1956/Oct. Nov./408.)

Stabilizing p.v.c.—A comprehensive review by E. Ferraris on the theory and practice of stabilizing p.v.c. by the use of various organic compounds. The account discusses stabilizers containing nitrogen such as amino derivatives; phosphorus containing compounds; sulphur containing compounds; stabilizers based on epoxy resins; phenol derivatives; esters; compounds such as the sodium salt of ethylenediamine N.N' tetra acetate; alkyl phosphites; derivatives of thiorurea, all of which are capable of reducing the action of ultra violet light on the plastics. Full references are made to all the appropriate patent numbers.
(*Materie Plastiche*, 1957/March/225.)

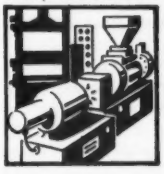
Radiation effect on polymers vibration characteristics.—Four authors from the Oakridge National Laboratories suggest methods of testing elastomers where cross-linking has been introduced by radiation.
(*Ind. & Eng. Chem.*, 1957/April/718.)

Decreasing co-efficient of friction in plastics for engineering purposes.—It is noted that the addition of small amounts of molybdenum disulphide powder in very fine form to polyamide resins can reduce the co-efficient of friction from 0.10 to 0.05 or below. At the same time, machining properties of the plastics are improved, whilst there is conferred upon them decreased tendency to adhere when one plastic compound is allowed to remain for long in contact with another. The strength of the plastic is virtually unaffected by such additions.
(*Österreichische Plastic Rundschau*, 1956/Dec./56.)

Blowing agent for p.v.c.—An appraisal and analysis of N, N'–dimethyl–N, N'–dinitrosoterephthalamide as a blowing agent in the preparation of cellular p.v.c. products has been prepared by M. F. Fuller. This agent is a nitrogen releasing compound and the report after reviewing its position continues with a method for producing slab foam material at atmospheric pressures.
(*Ind. & Eng. Chem.*, 1957/April/722.)

Site production of urea-formaldehyde resin foams.—An account by H. Baumann of a portable apparatus capable of being handled by two men for the *in situ* production of u/f foams which, by the addition of certain chemicals at the time of foaming, are invested with improved properties as the foam type is in this way modified. Use of this apparatus for application of u/f foam to timbering in mines is instanced as a desirable extension of safety measures already adopted in the mining industry. It is also of value in electrical engineering and in building for the *in situ* thermal insulation of piping ducts and the like and for partition-wall insulation.
(*Kunststoffe*, 1957/May/256.)

PROCESSES : MACHINERY



Hot-runner mouldings.—In an interesting article by G. Lemaitre, the advantages and limitations of automatic moulding of thermoplastics by the hot runner technique is discussed. Several detailed drawings of moulds employing this method are given and of particular interest is a mould employing a special heat chamber which directs the plastics material into two heated sprue chambers from whence it fills the mould cavities.
(*Industrie des Plastiques Modernes*, 1957/May/28.)

Injection moulding of internal threads.—A description is given of a Somner injection moulding machine which is fitted with an automatic withdrawing device for the former for internal threads in a moulding. On opening the die, the tool is "unscrewed" from the moulding by means of a rotating spindle synchronising with the die-opening mechanism.
(*Kunstoff-Rundschau*, 1957/May/201.)

Dies with changeable inserts to give various moulding forms.—A short practical article by Carl Mörwald discussing practical points in the design of a die with changeable inserts such that injection mouldings of various forms but of very high quality finish may be produced. The article is illustrated by a diagrammatic design of a die for a toy. The author points out that tool costs may be cut by 30–50% by the adoption of a practice such as this.
(*Der Plastverarbeiter*, 1957/Feb./57.)

INDUSTRIAL APPLICATIONS

Plastics and foodstuff packaging.—Robinson-Gornhardt considers practical means for determining any possible interaction between the plastic used for packaging of various foodstuffs and the foodstuff in contact with it. In this continuation of a previous account, possible contamination from plasticizers is discussed in relationship to foodstuffs containing water or oil, and in relation to overall contamination due to volatility of the plasticizer. The results of ether-extraction are considered as well as loss of weight at various temperatures due to volatility.
(*Kunststoffe*, 1957/May/265.)

Glass fibre reinforced polyester coatings for containers.—A practical account with working diagrams showing the various applications of glass fibre reinforced polyester covering for chemical apparatus such as containers, valves, flanged joints and the like.
(*Der Plastverarbeiter*, 1957/Feb./60.)

MISCELLANEOUS USES

Production of floating toys.—H. J. Morawski discusses the requirements of plastics for the manufacture of floating toys. These are manufactured in the main from p.v.c. and the author points out the need for airtightness, mechanical strength and water tightness of the plastic foil or sheet used. Furthermore, special requirements are called for as regards existence of various pigments and of course ease of welding is called for. High frequency sealing is suggested.
(*Der Plastverarbeiter*, 1957/Feb./55.)

Flexible drive stirrers.—In a new flexible drive stirrer by Townson & Mercer, the drive is fitted at its working end with a plastic chuck with three self-centring plastic jaws to take a variety of stirrers of shaft diameters between $\frac{1}{8}$ in. and $\frac{1}{4}$ in.
(*Instrument Review*, 1957/April/200.)

Plastic toys.—Observations and a review of the Eighth German Toy Fair in Nürnberg. The author first reviews the economics and extent and nature of the German toy industry using plastics as raw material. He points out how polystyrene and to a lesser extent cellulose acetate have replaced paper, wood and metal for toys, considers the various types of plastics used such as polyamide resins, polystyrene and polyethylene, and illustrates his account lavishly with examples of work from the Fair.
(*Der Plastverarbeiter*, 1957/Feb./41.)

Bonding Plastics to Metals

By J. V. EURICH

This article describes a new method of applying thermoplastic materials to sheet metal, and discusses possible manufacturing methods in this media

CONSIDERABLE interest has been aroused by a revolutionary new approach to the problems associated with the bonding of thermo-plastic materials to metal sheets.

This process, developed by the author, who is already well known in the field of novel practical inventions both in this country and in the United States, has the important advantage in that it makes provision for subsequent fixing of the laminated material to the framework by means of fixing lugs which can be attached in any desired position on the reverse side of the plastic-coated sheet by heat alone, without in any way damaging the decorative plastic surface.

This type of bond reduces both weight and cost, is claimed to be absolutely positive and permanent and will withstand extreme vibration and climatic conditions. It is also interesting to note that it is suitable for use with all types of metal and all types of plastics, including polyethylene and even polytetrafluoroethylene. (The technique used for bonding p.t.f.e. varies slightly from the one described herein.)

A very wide range of prototype samples has been prepared and various tests have been carried out to establish the fact that this process has advantages which may carry it to the forefront of this type of lamination.

The author's method deviates completely from either of the two conventional types of bonds exploited so far, namely the technique of spraying on the plastic material or sticking it on by means of adhesives. The method can perhaps best be described as constituting a " mechanical bond " as against the " chemical bond," and is achieved by perforating the metal sheet with small ($\frac{1}{16}$ in. diameter) closely adjacent holes (about $\frac{1}{4}$ in. spacing) and dishing the area immediately surrounding each hole (see Fig. 1) so that when plastic material is spread over the upper surface of the metal sheet application of heat and pressure will cause some of the plastic material to be forced through the holes to fill the indented areas underneath so as to anchor the plastic securely to the metal sheet at every hole. It has been found in practice that the finished lamination is quite inseparable. An example of the bonding method is seen in Fig. 2.

It is important to note that apart from providing a key for the plastic material, by dishing the area surrounding each hole the rigidity of the metal is automatically increased to a very considerable extent. Similar methods of strengthening metal sheets are being employed extensively on the Continent, their use being limited only by the unevenness of the surface which makes it unsuitable for many applications, but in the case of the author's mechanical bond the undulations are, of course, filled in with plastic material so that a perfectly smooth face on both sides is re-established. This can be seen to full advantage in Fig. 3.

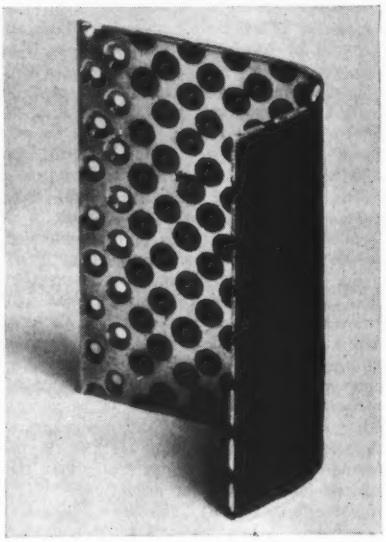


Fig. 2. Showing bond of plastic to metal.

An unusual feature of the mechanical bond is that its strength actually increases when the material is shaped, this being due to the fact that whichever way the lamination is bent the holes in the metal must of necessity assume a certain degree of ovality, in consequence of which the plastic material is nipped and held ever more tightly as the angle or curvature of form is increased.

The process of perforating and forming the metal sheet consists of a single combined operation and can be carried out on standard flat, progressive presses or it can be produced on a rotary press. Taking speed of operation at 5 linear ft. per minute × 4 ft. wide at £1 per hour the cost works out at 0·031s. per sq ft.

Assuming that a specification calls for 0.028 in. gauge metal (1.147 lb. per sq. ft.) it is possible to substitute 0.018 in. perforated and formed material (0.765 lb. per sq. ft. less area of holes = 0.689 lb. per sq. ft.) because as a result of the dishing operation the thinner gauge will assume the same rigidity value as the thicker, unformed, material. If the plastic coating is to be, say 0.008 in. thick, the additional weight would be approximately 0.062 lb. per sq. ft.

On this basis the saving in weight would work out as follows:—

Weight of originally specified material (0.028 in.) ..		1.147
Weight of reduced gauge (0.018 in. less holes one-tenth)	0.689	
Plus weight of plastic (0.008 in.)	0.062	
	——	0.751
Total saving in lb. per sq. ft.:		
Using steel		0.396
Using aluminium ..		0.086

The cost angle also looks very favourable:—

	s.	s.
Taking steel cost at £45 per ton—0.018 in. material ..	0.306	
Taking p.v.c. at £200 per ton—0.008 in. thick ..	0.110	
Cost of perforating and forming	0.031	
Cost of plastic coating per sq. ft. ..	0.031	
	——	0.478
Against originally specified material 0.028 in. thick ..		0.459
Total cost of plastic coating, punching and forming per sq. ft. ..		0.019

According to these figures, over $\frac{1}{2}$ lb. is saved in weight per sq. ft., a truly formidable consideration, and the additional cost added to the bare metal is less than $\frac{1}{4}$d. per sq. ft.

The advantages associated with the introduction of metal-plastic laminates has long been fully appreciated by a number of industries on account of the exquisite finishes which can be obtained by embossing and colour blending, and also because of low maintenance cost, all of which completely overshadow anything that can be done with paints.

It is envisaged that such materials can be

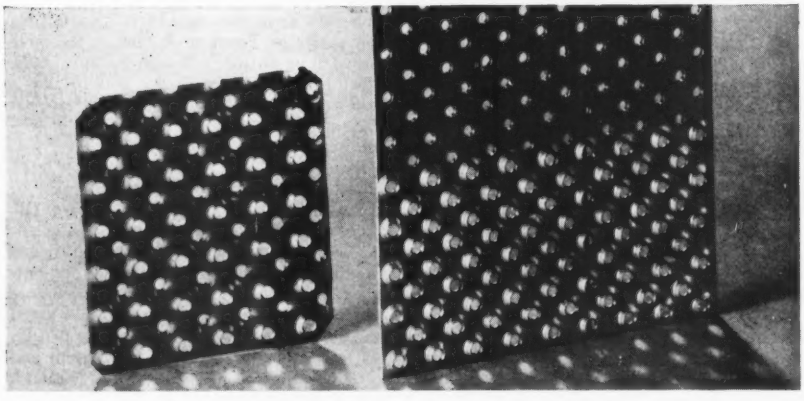


Fig. 1. Perforated metal sheets, showing effect of dishing.

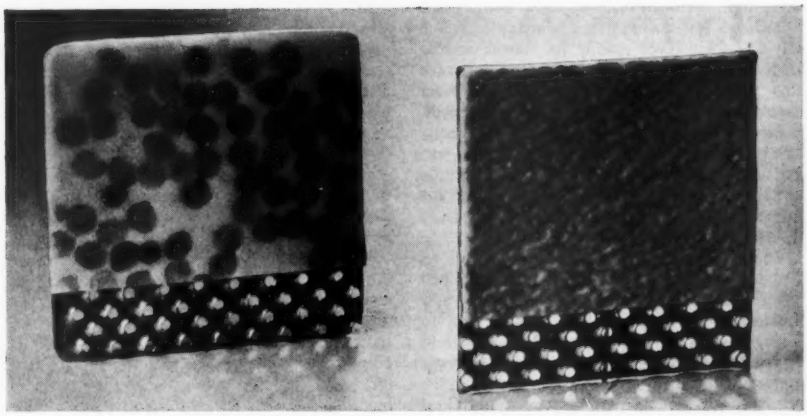


Fig. 3. Two samples of decorative surfaces obtainable.

effectively used for caravans, buses, filing cabinets, office tables, facia boards, chemical tanks, guttering, travelling trunks and a host of other applications. Where noise reduction is an important factor, as, for example, in partitioning, car roofs, etc., a plastic coating acts as a most efficient damping agent, but in the mechanical bond, by virtue of the perforations, the break-up of sound waves is so highly effective that this material can be said to be soundproof for all practical purposes. The sound absorption theory is, of course, based on a similar principle to that used in fitting perforated hardboard sheets to ceilings and walls.

These laminations are remarkably versatile, for they can be bent at any angle, swaged, deep-drawn, and formed into almost any desired shape without distortion or separation of the bond. Examples are shown in Fig. 4.

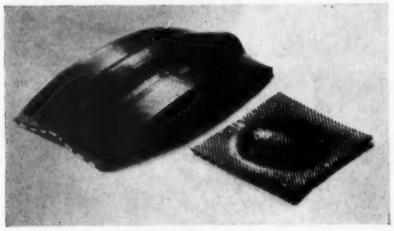


Fig. 4. Formed sections from plastic-coated metal.

Chemical bonds, using adhesives, have made rapid strides recently, both here and abroad, but so far they appear to have failed to overcome one cardinal requirement:—how to fix the finished laminate to a frame, especially if surface re-enforcements are stipulated, as, for example, on large sheets as used in caravan bodies.

The author has dealt with this problem by developing an ingenious fixing lug which can be securely attached to either side of the mechanically bonded sheet, by heat alone.

The fixing lug consists of a stem, which may be provided with a suitable hole to accommodate the bolt or screw, with which it is to be attached to the frame-work, a flat portion is perforated and plastic coated on the mechanical bond principle, and a short end is bent back upon itself so as to cover the plastic material on the inside of the lug, thereby preventing it coming into contact with the tongues which are used to place the lug in position on the laminated sheet. The method of fixing is seen in Fig. 5.

The fixing lug is gripped by means of a special pair of electrically heated and thermostatically controlled tongues and placed into the pre-determined position on the reverse side of the plastic coated sheet. The plastic area of the lug instantly welds to the plastic material which fill the holes on the underside of the laminated sheet. The tongues are released

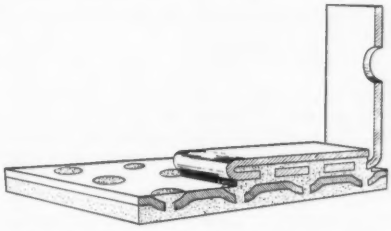


Fig. 5. Method of attaching fixing lug.

at once, heat dissipation is sufficiently rapid to prevent the embossed decorative surface from plasticizing so that no damage whatsoever is caused to it.

In order to obtain a particularly efficient weld the supporting roller used in the plastic coating operation can be finely grooved which will cause small ridges to form on the surface of the plastic rivet heads, these will be slightly proud of the metal surface. When the hot fixing lug comes in contact with the laminated sheet the small ridges plasticize instantly and collapse, this method prevents air being trapped between the bonded surfaces and also produces a most efficient and rapid joint.

It will be observed that this type of weld carries right through from the inside of the fixing lug—through the plastic contained in the holes of the lug—the plastic outer surface of the lug—the plastic contained in the holes of the laminated sheet—right through to the upper plastic surface, the shear strength exceeds all possible requirements and has been tried up to 40 lb. per sq. in.

The mechanical bond lends itself to single-sided and also to double-sided coating. For this purpose the metal can be merely perforated or it can also be dished, by dishing in staggered formation both upwards and downwards alternately, the rigidity of the metal sheet will be multi-directionally increased.

Double-sided bonds are particularly useful for gutterings on houses, especially if polythene with carbon content is used as this will resist all alkali, acid and ultra-violet ray attacks. It could be used for the manufacture of corrugated sheets, especially for localities where chemical fumes are prevalent. Other applications include water tanks, cisterns, distilled water cans, chemical tanks, travelling trunks, etc. In the latter case the inner coating could be of a different colour and finish to the upper coating.

In the double-sided bond the two surfaces weld to one another inseparably through each hole.

As there is always the possibility of accidental damage in use, a circumstance which can be very serious on large panels in difficult positions, it is essential that repairs should be possible. With a chemical bond this may be a little difficult but with the mechanical bond it is quite simple. The localized damaged area can be recoated by simply overlaying a piece of plastic material of the right size and colour and applying heat by means of an electric, thermostatic " iron." The superimposed piece will merge completely into the damaged area and bond itself to the dished holes.

The mechanical bond further lends itself to very simple edge-binding where it is considered that this is desirable, as, for example, on guttering, chemical containers, etc.

Extruded " U "-shaped strips can be run along the edges with a suitable electric, thermostatic " iron " and the strip will instantly weld itself to both sides of the laminated sheet, whether this is single-sided or double-sided. (See Fig. 6.)

Mechanically bonded sheet can be fabricated very much on similar lines to the technique employed in conventional uncoated

Fig. 6. Method of edging sheet.

sheet metal work, except that instead of riveting or spot welding joints, only heat need be applied with a little pressure to an overlapping joint and the two contacting surfaces will immediately weld together making an an extremely strong and completely watertight joint.

Another method of joining two sheets is by interposing a plastic extruded " H " pattern strip. (See Fig. 7.)

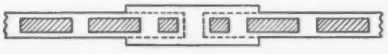


Fig. 7. Joining two sheets by using extruded section.

Canisters can be built up very much on standard lines, all joints being welded merely by running a specially designed electrically heated iron around them.

It is also possible to construct large tanks, for example, with an inner liner of perforated, dished metal sheet which can be spot welded in position, plastic material being subsequently sprayed on so that a completely joint-free plastic surface is obtained.

The adaptability of the mechanical bond to a large number of uses may be illustrated by the following suggested method of boat construction. Wide metal strips, coated on both sides with plastic material on the mechanical bond principle, are shaped as required to templates in the same way as timber planks are usually

shaped for this purpose, except that routing, band-sawing or similar means have to be employed to suit the particular metal used.

The ready shaped strips are joined edge to edge by the insertion between them of an extruded " H " section, plastic-coated, metal strip, heat and pressure being applied to weld the " H " section jointing strip to the shaped coated strips. In this way a complete hull can be built up of a size suitable for motor-boats, yachts or rowing boats. Since no mould is required, as would be the case in fibre-glass construction, there is no shape or size limiting factor.

The framework can be made of timber or metal-channel construction, the hull being subsequently bolted to the frame through holes in the centre of the " H " section strips.

Accidental damage to the outside, including deep scratches or tears in the plastic coating or even a severe dent or cracks in the metal parts will still leave the resilient inner plastic liner intact and watertight. All such damage can be remedied by applying plastic patches which are ironed in to leave behind no sign of the repair-work.

If required the bolt-heads can be easily plastic covered.

Plastic Bonding to Other Media

Having described in some detail the metal to plastic bonding technique, it may be appropriate at this point to draw attention to the various other materials such as timber, ply, and the various resin-bonded compressed boards, as for instance, hardboard, etc., which all lend themselves readily to plastic coating by the mechanical bond principle (although for this purpose larger holes and much wider spacing of the perforations are recommended).

Laminations of this kind are already available, but they are of the adhesive type. P.v.c., for example, has first to be very thinly coated onto textile fabric and then glued to the board, a somewhat costly method used largely for special panellings.

The mechanical bonding technique follows precisely the same method as that described covering metal coating. The board is perforated and when necessary compressed to form a countersink or counterbore effect at each hole on the reverse side, and the plastic material is applied by heat and pressure in the normal way to cause the plastic material to key securely into the countersinks if single-sided lamination is used, or to weld to itself through each hole if plastic coating is applied to both surfaces.

It is easy to imagine how simply and cheaply a boat can be constructed on the " make it yourself " principle or professionally by the use of hardboard, coated with reasonably thick layers of polyethylene or p.v.c. on both surfaces. All necessary shapes can be cut out with a saw, edge-to-edge joints can be made quickly and neatly by insertion of " H " section extruded plastic strip which can be heat-bonded with quite simple and readily available electric irons. For more rigid construction plastic coated extruded metal " H " section strip can be used. Raw outer edges are sealed off with " U " section extruded strip. The " planks " can be screwed to the framework with ordinary countersunk screws, subsequently to be sealed over with small plastic discs to cover the heads of the screws.

Repairs are simple and cheap, no painting or special tools, are required, the finished hull is strong, durable, watertight, light, and can be produced in two or more colour tones.

The question as to who should make the laminated material has received very serious consideration for some time because of the problem of maintaining economic stocks, there being an almost countless number of combinations of types owing to the fact that requirements may call for different types of metal, different gauges, different types of plastic material, colour and finishes.

With the mechanical bond it has been suggested that this difficulty may readily be met by arranging for the rolling mills to produce the perforated, dished sheets and letting the ultimate user carry out the plastic coating operation to meet his own particular requirements. This would also overcome the risk of possible transport damage.

The author has now reached the stage of operating pilot runs; commercial exploitation has not yet been arranged but appearance of this type of material on the market is not expected to be long delayed.

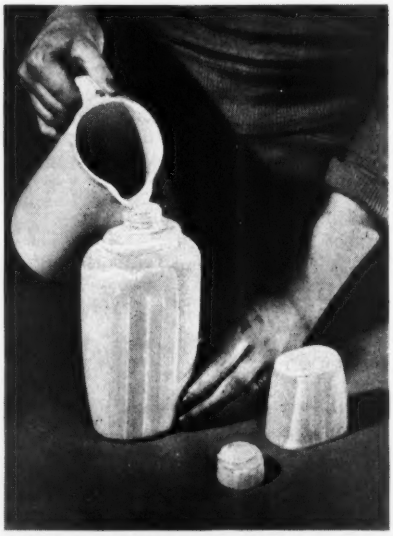
Alkathene Circus Film

WE have long believed that the advertisement pages in British technical journals are the best in the world—in telling the story, layout, use of colour and in the judicious use of humour, which latter we believe no other nation uses in the technical field. We believe that such advertisement in the plastics world has played no small part in the now acknowledged acceptance of plastics by the customers, including the greatest customer of them all, the housewife. The cinema film now begins to play its part and last month we had the pleasure of seeing one of the most brilliant of publicity films yet made, at the London offices of Imperial Chemical Industries Ltd.

The movement of inanimate objects has been done for many years but the " Alkathene Circus " was beautiful, and of outstanding ingenuity, made to show the housewife the numerous household goods made of polythene that are now available, and their true value. The director, M. Étienne Raik, has transformed them into the actors in a circus. After the Grand Entry into the Ring of all the performers in regimented formation, we see trapeze artists (colanders) swinging and flying, trained horses (brushes) cantering and cavorting round the ring, acrobats (cups and saucers) jumping, twisting and balancing in intriguing patterns.

Commencing on June 2, this two-minute colour film will be shown to six-and-a-half million people in seven hundred cinemas throughout Britain. In convincing the audience of the merits of polythene, the film will also help the moulders and fabricators of all the items seen in the film, for a full credit list of the makers of all the articles is shown at the end.

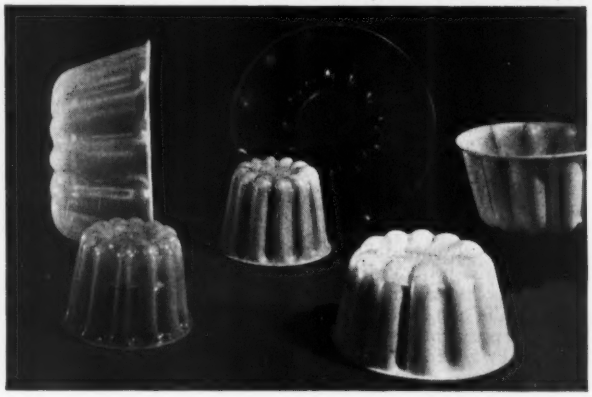
The " Alkathene Circus " is certainly one of the most original and ingenious advertisement films made for a very long time.



Alkathene flask for picnics and the nursery.

(Left) Washing-up bowl made by Addis, having great strength but little weight.

(Right) Jelly moulds in various colours. Both bowl and jelly moulds are made from Alkathene.



New Productions

Extruded p.v.c. roller shutter.

Roller Shutter

A recent production of National Plastics (Sales) Ltd., is the plastic roller shutter shown in the accompanying illustration. The shuttering is extruded from unplasticized p.v.c. and each slat is simply interlocked with the adjoining member providing a flexible and strong link. The shutters are already available with ½ in. slats for use in a variety of domestic applications to which their wide range of colours suit them.

Wider slats of ¾ in. and 1 in. will soon be in production which will considerably extend the field of application for these shutters.

P.t.f.e. Thin Walled Tubing

The production of Fluon (p.t.f.e.) in a very fine state of division in aqueous suspension has made it possible, by coagulating the suspension, to extrude the material in thin walled tubing. This has the advantage over thick walled tubing (which was all that could be made from the granular form of the polymer) of considerable flexibility and resistance to flexural fatigue. Thin walled Fluon tubes can handle a greater range of chemicals over a wider temperature range than any other flexible material; and also the non-friction properties of the polymer mean that very small internal diameters can be used and the bore is easy to clean through.

A list of the more usual sizes available and further details can be obtained from P.T.F.E. Engineering Division, Crane Packing Limited, Slough, Bucks.

This company has also developed a new technique for manufacturing 'U' and 'V' ring packings in p.t.f.e. This new technique imparts a super-fine finish to the surfaces of 'U' and 'V' rings, and clean, accurately formed 'lips.' This was previously impracticable using conventional moulding techniques.

Refrigerator Liner

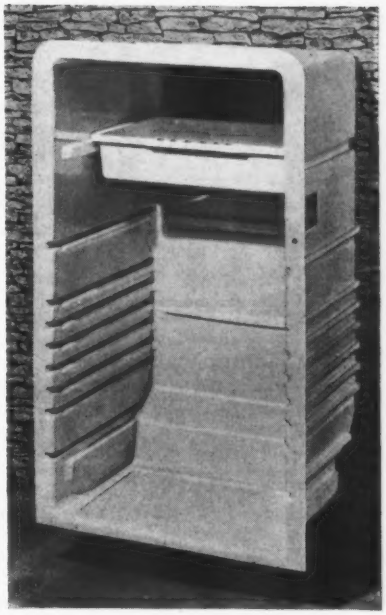
The first of many possible applications of a new deep moulding technique perfected by Clearex Products Limited, Heather Park Drive, Wembley, Middlesex, on 0.160 in. "Iridon" high impact polystyrene sheet is now on the market. It is the plastic liner incorporated in the Lec Refrigeration Limited's 6 cu. ft. model, "The International."

This model is the first of its size in this country to have a completely plastic interior. This development represents a revolutionary step in refrigerator design.

The dimensions of the plastic liner are 36 in. high, 22 in. wide and 16¾ in. deep. The pre-stretching and "snap back" process evolved by Clearex Products Limited, has made possible fabrication in plastics sheet of considerable depth.

Advantages in the use of this forming method are cheap tooling and comparatively simple operating techniques. This gives great versatility and speed in production and design: new models can be introduced with a minimum of delay and outlay. In fact the original development of the liner by Clearex Products Limited, took only five months from the design to the production stage.

Iridon sheet is manufactured by Commercial Plastics Ltd., 1 Avery Row, Grosvenor Street, W.1.



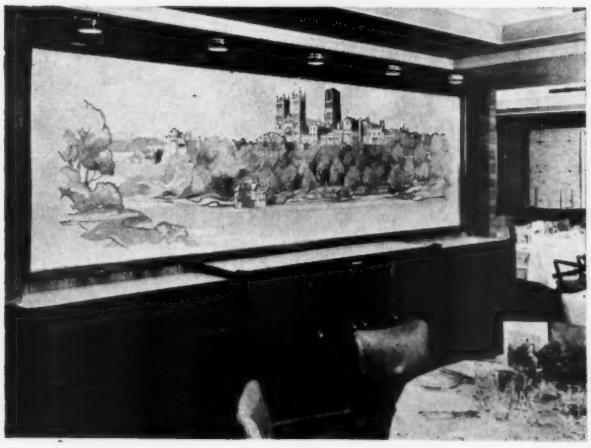
Vacuum-formed polystyrene refrigerator liner.

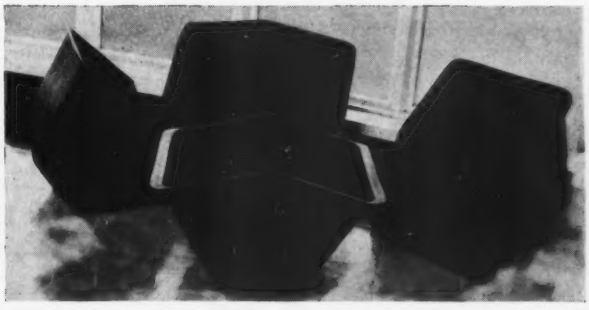
Elevator Buckets

Illustrated is a group of black gravity feed buckets for chain elevators which Universal Metal Products Ltd., Langley Rd., Salford 6, Lancs., are making from glass-reinforced plastic material, and which are used by the North Western Gas Board for carrying spent iron oxide on overhead conveyor systems.

Other applications are the conveyance of chemicals, earth and various solid fuels.

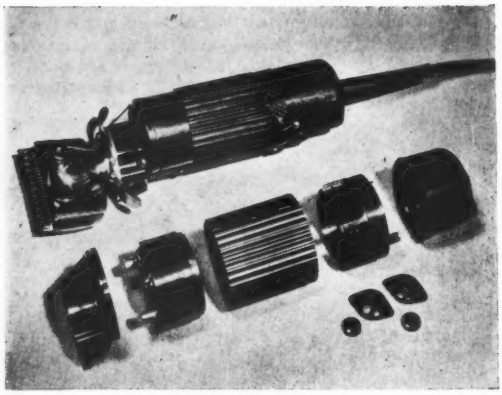
These buckets, measuring 14 in. × 19 in., including flange at the top, narrowing to 7 in. × 12 in. approximately at the base, with 1 in. flanges on short sides and ½ in. flanges on longer sides, 10 in. deep, have great tensile strength combined with light weight. They will not corrode, are resistant to weak acids and alkalis, and are relatively unaffected by humid atmosphere.



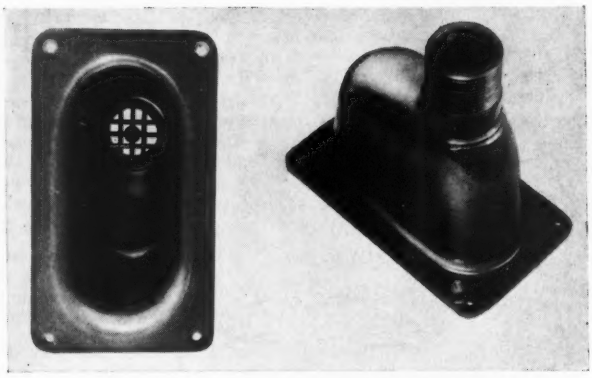


(Above) Elevator buckets manufactured by Universal Metal Products Ltd., from glass reinforced plastics.

(Left) A mural designed in Formica by Mr. R. D. M. Robertson and used in the new Canadian Pacific liner the S.S. "Empress of England."



Phenolic mouldings used in shearing clippers.



Press moulded rigid p.v.c. drip cup manufactured by Turner & Brown Ltd.

Phenolic Mouldings in Shearing Clippers

Recent development work by Wolseley Engineering Ltd., in conjunction with Bakelite Ltd., has resulted in the production of a reliable and robust electrical clipper for use in trimming and shearing animals. The clipper incorporates nine phenolic mouldings produced by British Plasticon Products, three of which are in special grades. In addition, the grilles are fabricated from Bakelite Laminated Grade F 294/9.

One of the chief problems encountered in the development of this clipper was to combine electrical safety and physical robustness with true portability. This was achieved by the use of a fibre-based Bakelite phenolic material giving a high strength/weight ratio and by incorporating double insulation at all vulnerable points.

Further difficulties arose when the import regulations of other countries were examined with a view to export, the brush cover being re-designed to comply with some restrictions. Several alterations were made to the air vents to keep out the fine hairs which are the natural product of clipping, whilst allowing adequate motor ventilation.

A New Vinyl-coated Fabric

In conjunction with one of the world's largest manufacturers of sports and waterproof clothing, Arlington Plastics Development Ltd., have produced a new vinyl-coated fabric designed especially for ladies reefer jackets, rainwear, sportswear, etc. This latest addition to the Arlinghide range is known as GJ/22 quality Skiver.

Printed Polystyrene Tubes

The Metal Box Company is now able to offer printing on white polystyrene tubes. At present this is confined to line printing in two colours, but the effect is both attractive and striking. An extremely high standard of decoration can be obtained, with no loss of adhesion of the print to the surface of the tube.

White tubes (but not transparent ones) can be printed in up to two colours, with a choice of orange, crimson, scarlet, black, green, turquoise, Chinese blue, deep blue and mid-red shade blue.

Printed polystyrene tube.

P.V.C. Drip Cups

Turner and Brown Ltd., Davenport Street, Bolton, have now added to their range of equipment an entirely new design in Laboratory Drip Cups.

Press moulded from Cobex rigid p.v.c. sheet the Turbo drip cup has many advantages over conventional Glazed Fireclay, Ebonite and Polythene Drip Cups of the Funnel design.

The drip cup can accommodate one or two swan neck taps and still be fitted into normal bench service space and has a screwed outlet 1¼ in. B.S.P. and can therefore be used with most types of metal or plastic screwed fittings (the length of this can be made to suit customers' requirements). A sieve is incorporated in the outlet which can be easily removed to facilitate cleaning.

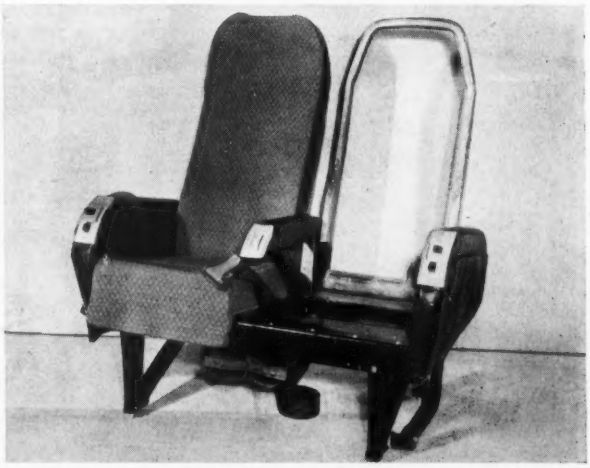
Glass Fibre Aircraft Passenger Seat

A prototype glass fibre aircraft passenger seat has been designed to a Ministry of Supply specification based on a BOAC requirement.

The research and design work has been undertaken by the Microcell group of companies. By utilizing to a maximum extent the properties of lightness and strength of this material, a saving of weight of at least 15 lb. over metal seats of similar design is obtained.

The main components for the glass fibre seat were produced from moulds and bonded together. The seat is easily detachable and the legs are adjustable to cater for various positions in an airliner. The energy absorption properties are greater than metal, and a large amount of fatigue testing has been carried out with the material. The prototype seat has passed current Air Registration Board requirements, including 10·8g forwards.

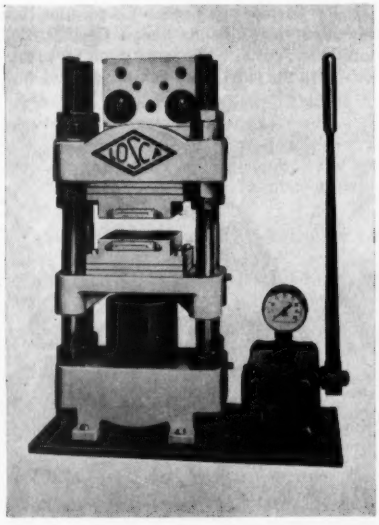
(Right) Prototype glass reinforced plastics aircraft seats manufactured by Microcell and shown at the Paris Air Show. (Below) A new type of microphone manufactured by Cosmocord Ltd. using Styron 475 polystyrene.



Plastics News

Plant and Equipment, Materials, Processes, Company News, Technical Literature, Exhibitions, Personal Notes and Meetings.

20-TON BENCH PRESS.—The Losca Press, developed by London and Scandinavian Metallurgical Co., Ltd., Wellington Works, Wellington Road, London, S.W.19, was designed primarily to meet the demand for a robust and reliable bench-type press for the production by compression moulding of acrylic teeth. This press, however, has proved very adaptable for many other purposes, including the moulding of thermosetting plastics, forming, vulcanizing, embossing, etc., as well as being eminently suitable for a variety of laboratory experiments. A brief specification of the machine is as follows: Crosshead, centre platen, and base unit of robust construction in Meehanite; hydraulic unit by Tangye Ltd. with two-speed double-acting hand-pump, 4 in. diameter ram with 2½ in. run-out; on double-action, 12 strokes of lever raises platen 1 in.; effortless maximum pressure obtained by easily operated change-over valve; maximum daylight with standard columns without hotplates, 12½ in. Longer columns available to customers' requirements; standard hotplates available with heating area 8 in. × 6 in. complete with asbestos backing and fitted with check thermometers. Total thickness of hotplates including asbestos backing 4¾ in.; thermal control equipment: where precision control of temperature is necessary, adjustable bi-metal thermostats in conjunction with hot wire vacuum switch relays and a control panel are used. For less stringent requirements energy regulators are supplied. With either form of control a panel is supplied with on/off switch and warning lamps; overall height of press with standard columns, 31 in. Base dimensions, 26 in. × 14 in. Approximate weight, 4 cwt.



The Losca 20-ton bench press.

DEFLASHING OF PLASTICS MOULDINGS.—The Wheelabrator tumblast machine, manufactured by Tilghman's Ltd., of Broadheath, Altrincham, is a batch loaded machine, used primarily for the airless shot blasting of small castings, forgings, etc., using iron or steel shot as the abrasive. The barrel, or work container, consists of an endless rubber belt, driven on three roller shafts, which is cradled about two trunnion heads. This barrel has a work capacity of 1½ to 2 cubic ft. and, in motion, the work is turned over under the blast of an abrasive projection wheel. The abrasive is automatically cycled ensuring continuous operation and is rendered free from useless dust by the exhaust system which consists of an exhaust fan and fabric tube filter.

Some years ago it was found, both in the U.S.A. and in this country, that this machine could be successfully adapted for the deflashing of plastics, by the substitution of a "soft" abrasive, i.e. crushed apricot, plum and peach stones or coconut shell.

It was then found necessary to fit a variable speed drive to the work conveyor barrel, also a choice of speeds on the abrasive wheel, and these variations were found invaluable when processing various types of parts. In the processing of very small components of the ¼ in. and ½ in. variety which could be lifted by the blast and broken or lost through the perforations in the conveyor belt, these difficulties are overcome by placing the parts in a fine wire mesh barrel which revolves on the conveyor belt. Large parts which could be damaged when tumbling at normal conveyor belt speed can be tumbled at a lower speed to obviate this danger.

Times for deflashing per load in this type of machine vary from 5 to 20 minutes, and in dealing with smaller parts, up to 5,000 pieces per load can be deflashed in 15 minutes.

The machine is completely self-contained, requiring only 18 sq. ft. of floor space, and a total of 9½ h.p. is required to operate the machine, including the exhaust system.

In cases where the output volume warrants the installation of two machines, operation costs can be reduced by using only one operator for both machines. Cycle times are approximately 15 minutes per load with about two or three minutes of this time for loading and unloading, and this allows a fair margin for general work inspection.

The deflashing of larger parts, such as radio cabinets, hair dryers, and all parts that do not lend themselves to the barrelling process, can be deflashed on the multi-table type of Wheelabrator. Here again the abrasive is projected from a wheel, or wheels, on to the parts which are carried on the tables which traverse radially and rotate under the blast stream, the operator manually loading and unloading and turning over the parts where necessary.

The Wheelabrator deflashing machine.

In smaller quantities these larger pieces can be speedily deflashed in a cabinet using a compressed air jet to propel the abrasive.

General

Carbon Black and Polyethylene.—A discovery by the Research and Development Department of Godfrey L. Cabot, Inc., Boston, suggests a new range of usefulness for polyethylene and other plastics. Christened the CAB-XL process, it is reported as employing chemical methods and conventional rubber and plastics manufacturing equipment. New compositions of matter are created in which finely-divided pigments and polymer are combined in an effective manner, and carbon black loadings can be increased to a very considerable degree, and CAB-XL-polyethylene compositions containing 50% and more carbon black remain flexible, even at extremely low temperatures.

The Cabot laboratories have tested their discovery in a variety of moulded and extruded products. Polyethylene pipe, continuously fabricated using a CAB-XL composition containing 100 parts of carbon black, exhibited a new and unusual combination of properties. These include an unusual resistance to stress cracking, a marked improvement in high-temperature behaviour, virtual elimination of plastic flow, and improved resistance to deterioration by solvents and oils. Laboratory tests indicate that burst strength has been doubled both at room temperature and elevated temperatures. In addition, substantial savings are made possible by the use of large quantities of low-cost carbon black. Experiments with

CAB-XL-polyethylene compositions for wire and cable coverings show great promise. The outstanding improvement in physical properties found in polyethylene pipe are duplicated in wire coverings. The unusually smooth extrusion obtained are particularly valuable in this field.

Godfrey L. Cabot, Inc., are one of the largest producers of carbon black in the U.S.A. and have a plant in Great Britain at Stanlow and offices, Cabot Carbon Ltd., in London.

Low Molecular Weight A.C. Polyethylene.—Kingsley and Keith Ltd. announce that they are now offering on behalf of their principals, The Allied Chemical and Dye Corporation, Semet-Solvay Petrochemical Division, a new product for the polyethylene injection moulder.

This is A.C. Polyethylene 6, a low molecular weight polyethylene (*c.* 2,000), in easily handled miniature cube form. The advantages reported of blending A.C. Polyethylene 6 with normal polyethylene stem from its very low melt viscosity and unique flow properties. These properties make it possible to mould articles with ease which had previously required extra high ram pressures and will reduce the scrap rate with moulds which are difficult to fill with normal polyethylene. Owing to the reduced pressure required cycle times can also be cut.

The correct amount of A.C. Polyethylene 6 to be added to give the best results, is dependent on the melt index of the polyethylene that the moulder is currently using, but will be approximately between 5–15%. This can be added either during the normal tumbling operations or can be mixed manually together with a coloured master batch. No special mixing operation is necessary.

Extensive tests have been carried out on the physical properties of moulded articles incorporating A.C. Polyethylene 6. The stiffness of articles made from blends containing up to 15% A.C. Polyethylene 6 was found to be the same, or slightly greater, than with straight normal polyethylene.

There was found to be no significant change in the hardness of the products containing moderate amounts of A.C. Polyethylene 6. Heat distortion temperatures are, however, slightly lowered, but only by a few degrees.

Full information on A.C. Polyethylene 6 may be obtained from Kingsley and Keith Ltd., 110 Victoria Street, London, S.W.1.

Angle Attachment for Electric Drill.—A new angle attachment for Bosch ¼ in. and $\frac{5}{16}$ in. standard electric drills enables an operator to drill, remove carbon, or grind parts of machinery which are not normally accessible. The attachment is 8 in. long and has a Jacobs or collet chuck set at 90° to the main drive. It slips over the head of the tools and threads into position, forming an integral part of the machine. The head of the attachment is very small enabling the machine to pass through apertures only 1⅛ in. in diameter. Further details can be obtained from Trend Industrial Equipment Ltd., 5 The Ridgeway, Stanmore, Middlesex.

INTERNATIONAL BRITISH PLASTICS EXHIBITION

The Editor and Staff of *Plastics* will be pleased to offer their services to all visitors to the exhibition and will be available on Stand **B5.**

Portable Metal Detector.—Metal Detection Ltd., of Moseley Street, Birmingham, 12, now offer a portable lightweight detector incorporating transistors. The equipment comprises a hand unit and earphones, and enables hidden metals to be easily located.

British-designed Plastics Plant for Poland.—The order for the design of a large-scale polystyrene plant in Poland has been awarded to Petrocarbon Developments Ltd. The process employed is that originally engineered by Petrocarbon for Styrene Products Ltd., an associate of Shell Chemical Company Ltd., and for an installation in France owned by the Pechiney group. The new plant will incorporate the latest operating experiences of Styrene Products Ltd.

Correction.—The photograph in the top left-hand corner of page 160 of the May issue of *Plastics* was incorrectly captioned and should have referred to protective casing not chemical ducting.

Company News

L. Richoux Co. (London) Ltd., 32 Finsbury Square, London, E.C.2, have been granted sole distribution of the Stonex mineral compound which can be used for mould making where only low pressures, such as in vacuum forming, are used.

The Metal Box Company Limited and E. Shipton and Company (Holdings) Limited announce that arrangements have been completed for the acquisition by Metal Box of the plastics bottle business in the United Kingdom of E. Shipton and Company Limited, who have been marketing these products through Industrial Appliances Limited.

Metal Box are taking over the factory premises and plant at Ruislip and will continue to use the trade marks Poly-Tainer and Nylo-Tainer and customers will be notified accordingly.

Appropriate details of the transaction will be notified to Shareholders of E. Shipton and Company (Holdings) Limited by a separate Circular from that Company whose business will otherwise continue unchanged.

Catalin Ltd.—A dividend of 6% has been recommended by the directors of Catalin Ltd. for 1956. The net profit for the year was £15,031 as compared with £9,371 for 1955.

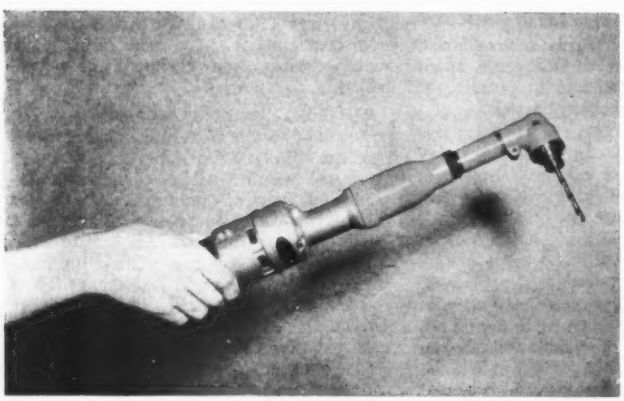
Bakelite Ltd.—A final dividend of 10%, making a total of 15%, for the year ended December 31, 1956, was proposed by the directors of Bakelite Ltd. in presenting their report. Trading profit for the year was £474,921 as compared to £645,725 for 1955.

The British Xylonite Co., Ltd.—In the report for the year ended December 31, 1956, the consolidated net profit for the group was given as £325,855 against £336,797 in the previous year. A final dividend of 8% was declared, making a total for the year of 11%. **Mr. C. F. Merriam,** chairman of the directors, retired from the board at the end of the meeting having reached the age of 70. Mr. C. F. Merriam joined the board in 1912 and was appointed chairman in 1933.

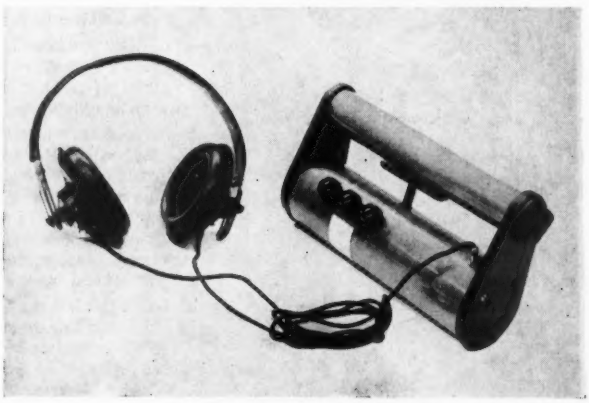
John Dale Ltd.—The report for the year ended December 31, 1956, recommends the payment of a final dividend of 9d. per ordinary share, making a total dividend of 1s. 1½d. Net profit for the year is £254,679 as compared to £284,568 for 1955.

George Ellison Ltd. and Tufnol Ltd. announce that their London branch office is now at Ellison House, Connaught Place, London, W.2. Telephone number Ambassador 3121.

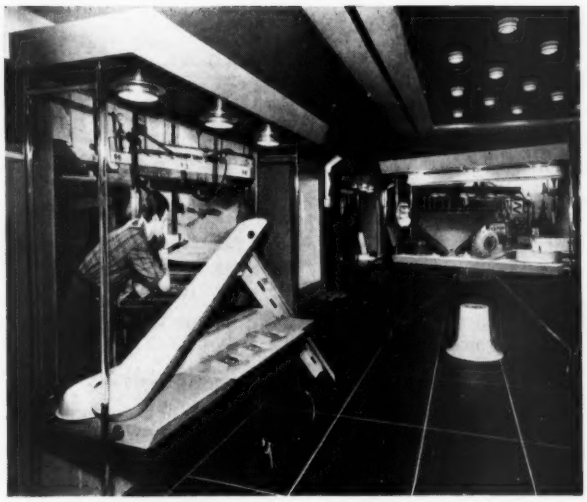
Union Carbide and Carbon Corporation have shortened their title to Union Carbide Corporation. They also announce plans for greater activity in the vinyl foam field where they have



The Bosch electric drill with angle attachment.



Portable metal detector.



A general view of the Exhibition held at Imperial Chemical House showing the many uses for Darvic p.v.c. sheet.

obtained the patents and experimental equipment in this field of Elastomer Chemical Corporation.

Dallow Lambert & Co., Ltd., have moved into a new factory at Thurmaston, Leicester.

Shell Chemical Co., Ltd., and O. & M. Kleemann Ltd. announce that arrangements have been made whereby O. & M. Kleemann, or its subsidiaries, will have certain plastics raw materials manufactured by Shell Chemical Co., Ltd., or its associates, which will be marketed under the trade names of O. & M. Kleemann.

Under this arrangement Kleestron Ltd., a subsidiary, will have its polystyrene manufactured at the Partington Plant of Styrene Products Ltd., an associate of Shell Chemical Co., Ltd.

Kleestron will continue to operate as an independent organization marketing their products in the same manner as they have done since they began production of polystyrene in 1951, and their selling arrangements and policies, both at home and abroad, will be maintained.

Courtaulds Ltd. announce the adoption of the trademark "Courpak" to denote their cellulose acetate film, which is marketed by British Cellophane Ltd.

Rowe Bros. & Co., Ltd., have opened a new sheet plastic warehouse and trade counter, with increased storage and cutting capacity, at 39/45 Victoria Street, Bristol.

Fothergill and Harvey (Sales) Ltd. are now marketing a mat of chopped glass strands designed for use in reinforced plastics. The mat, known as "Tygamat" consists of short glass fibres in random distribution to give equal strength in all directions.

Metropolitan-Vickers Electrical Co., Ltd., announces that the postal address of the Transformer Department will be Floats Road, Wythenshawe, Manchester, 23.

New company, to be known as Klockner Moeller England Ltd., has been formed to market in the U.K. electrical control gear manufactured by Klockner Moeller, Bonn.

The company at present has offices at 4 Queen Street, Mayfair, London, W.1, and Prince's Buildings, 28 Oxford Street, Manchester.

Kingsley and Keith Ltd., 110/112 Victoria Street, London, S.W.1, have been appointed the exclusive distributors by Eastman Chemical Products Inc., which sells all the products manufactured by the Tennessee Eastman and Texas Eastman Divisions of the Eastman Kodak Co.

These companies produce a wide range of aliphatic and aromatic chemicals.

Durham Raw Materials Ltd., 1-4 Great Tower Street, London, E.C.3, are now the selling agents for the clays produced by Messrs. Watts, Blake, Bearne & Co., Ltd., of Newton Abbot, Devon. This agency extends to all industries other than the ceramic and refractory trades.

Tube Investments Ltd. announces the formation of a new subsidiary company, TI Nuclear Engineering Ltd., with head office at The Adelphi, London, W.C.2, to assist its operating companies which are concerned with activities in the atomic energy industry in the promotion of business at home and abroad.

Commercial Plastics Ltd.—The formation of three new marketing companies, wholly-owned subsidiaries of Commercial Plastics Ltd., has been announced by Dr. J. Pomeraniec.

Operating this month, all three companies are at present based at head office, No. 1 Avery Row, London, W.1. They are: **Commercial Plastics (Sales) Ltd.,** responsible for the sale of Fablon p.v.c. light film and Superlon heavy sheet; **Fablon Ltd.,** responsible for the sale of all consumer products; **Iridon Ltd.,** responsible for the sale of rigid thermoplastic sheeting.

Personal

Sir Laurence Merriam has been elected chairman of the Association of Chemical and Allied Employers for the next two years. Sir Laurence is also chairman of the Furniture Development Council and managing director of B.X. Plastics Ltd. He also holds several other directorships within the plastics industry.

Mr. A. W. Scott, managing director of Shawinigan Ltd., London, England, has been elected to the board of directors of Shawinigan Chemicals Ltd.

Sir Alfred Herbert, K.B.E.—It is with regret that we hear of the death of Sir Alfred Herbert, founder and chairman of Alfred Herbert Ltd., who died on Sunday, at Hurstbourne Priors, he was 90.

Sir Alfred was knighted in 1917 for his wartime work at the Ministry of Munitions. He was the former President of the Machine Tools Trade Association and for the past 54 years President of the Coventry Engineering Society. Sir Alfred was an Officer of the Legion of Honour and an Officer of the Order of St. Leopold (Belgium).

British Plastics Federation Publicity Committee.—The Council of the British Plastics Federation has elected the following to the Publicity Committee for the session 1957–58: Mr. D. Radford, Mr. R. Buckley, Mr. A. R. Crew, Mr. G. C. Graver, Mr. P. I. Smith, Mr. R. MacDonald Watson, and Mr. Andrew Reid, Press Officer. Ex officio members are: Chairman of the Council, Vice-Chairman of the Council and Immediate Past Chairman of the Council.

Mr. A. Fitzsimmons.—It is with regret that we hear of the death of Mr. A. Fitzsimmons, A.M.I.E.E., who died on April 26, aged 62. He joined The Micanite and Insulators Co., Ltd., as chief rate fixer. Prior thereto he was for 18 years with Metropolitan-Vickers, Trafford Park. He was Mayor of Chingford during 1950–51.

Mr. J. R. Taylor has been appointed area engineer for the West of England for Kelvin & Hughes (Industrial) Ltd.

Mr. Felix L. Levy, joint managing director of George Cohen, Sons & Co., Ltd., has been elected President of the National Federation of Scrap Iron, Steel and Metal Merchants.

Mr. P. Marshall, for 11 years general manager of Mentmore Manufacturing Co., Ltd., Plastics Division, has resigned to join the Board of Directors of Universal Plastics Ltd., Brook Road, Wood Green, N.22.

A. and J. McCullock and Miller, of 180 West Regent Street, Glasgow, are to act as agents in Scotland and Northern Ireland for Arthur Dixon & Co., Ltd., of Ragland Street, Halifax, manufacturers of strip and wire articles.

Mr. A. T. Honnor has been appointed general sales manager of Frazer and Glass Ltd., and **Mr. H. Grubb** has been appointed technical sales manager of their industrial division.

London Section Committee.—The officers and members of the London Section Committee of the Plastics Institute are as follows: Chairman, C. W. Welch; Vice-Chairman, D. S. Mahon; Hon. Secretary, C. W. Oakhill; C. L. Child, J. Gadsby*, W. J. Marmion*, A. B. Merriam, P. Morgan, E. S. Narracott, V. J. Wentworth* and J. D. Winston. The newly-elected committee members are marked with an asterisk.

Golf Results.—Results of the P.I.G.S. meeting at Addington Golf Club on May 14 were: "F. A. Hughes" Trophy: Winner, J. Corbishley, 34 points; runner-up, H. E. Harden, 32 points. Visitors' Prize: A. Lang, 34 points. Styrene Products' Prize: Winners, P. Smith and L. C. Pendry, 36 points; runners-up, C. Parkinson and G. W. Brown, 34 points (best last nine holes). Visitors' Prize: A. Lang and J. Terry, 28 points.

"THE PROPERTIES AND TESTING OF PLASTICS MATERIALS"

This book of 208 pages will be published on July 10, 1957. Copies can be obtained from booksellers, price 30*s.* net, or from Temple Press Ltd., Bowling Green Lane, London, E.C.1, price 31*s.* post free.

Machines for the Industry

Daniels 20 ton Alkyd Press

A report on a new press, to be shown for the first time at the International British Plastics Exhibition at Olympia next month. Key numbers in the text are related to the drawings opposite.

THE advent of alkyd moulding powders has made it possible to shorten cure times to such an extent that the idle part of the cycle is an appreciable percentage of the overall moulding operation. The press about to be described was designed in order to provide a machine which would make full use of these improved powders.

One of its advantages is its high operating speed, but of equal importance is the fact that is has been designed so that the press may be used as part of an automatic moulding unit. For this reason, great care has been taken to avoid any obstruction around the daylight.

The press is of the prefilling, downstroke type, having an annulus type main ram (1). At the maximum working pressure, which is 3,600 p.s.i. the main ram load is 20 tons and the return load five tons. Within the main ram is a fixed prefilling ram (2). At the beginning of the closing stroke oil pressure, operating through the central hole in the prefilling ram, forces the table downwards. During this part of the stroke, oil from the supply tank is being drawn into the main cylinder through a prefiller valve. When the moulds meet, the prefiller valve closes and pressure is built up over the full area of the main ram. In order to avoid leakage over the piston rings, high pressure is admitted to both sides of the main ram.

Control of the main ram is by two piston type control valves (3), gasket mounted on to the cylinder. These valves are pilot operated, and are controlled by the push buttons (4).

In view of the high closing speed of the press, the final approach speed must be limited, in order to avoid damage to the moulds and displacement of the moulding powder. This reduced speed commences when the roller (5) is operated by the moving table. At this part of the cycle the speed of the press is controlled by the two valves (6), one of which controls the closing speed, and the other the opening speed.

Pump Assembly

The pump assembly, complete with a 7½ h.p. driving motor (7) is housed in the base of the machine. High pressure oil is taken to the main cylinder via the hollow columns, thus reducing to a minimum any obstruction at the sides of the press. The capacity of the pump is sufficient to give a maximum closing speed of 10½ in. per second, and an opening speed of 5½ in. per second.

Ejection Mechanism

Several methods of ejection are possible, using lugs (8) on the moving table or the hydraulic unit (9) which is illustrated in greater detail in figure 2. This unit has a double acting ram, and is controlled by a pilot operated piston valve (10) controlled by push button on the panel (4). The speed of ejection is approximately 3¾ in. per second. The maximum stroke of the ejector is 3 in., and this figure is adjustable by the nuts (11). The actual ejection may be by the bars (12) which run from back to front of the press, outside the platens, by ⅝ in. diameter rods, which operate through four holes (13) drilled through the electric platens, or by the central plunger (14).

In the case of the mechanical ejection, operated by the moving table, this may operate on either the upper or lower part of the mould. In the case of top ejection, this would be by means of four ⅝ in. diameter rods, operating through holes in the platen, similar to the holes (13) in the lower platen. The top ejection mechanism is returned by springs.

Mechanical ejectors on the lower table would be by bars running from front to back of the press, and automatic reset of these ejectors is available if desired.

The press is fitted with electric platens (15) 14 in. square, each having elements totalling 2,800 watts, controlled by two Cambridge thermostats (16).

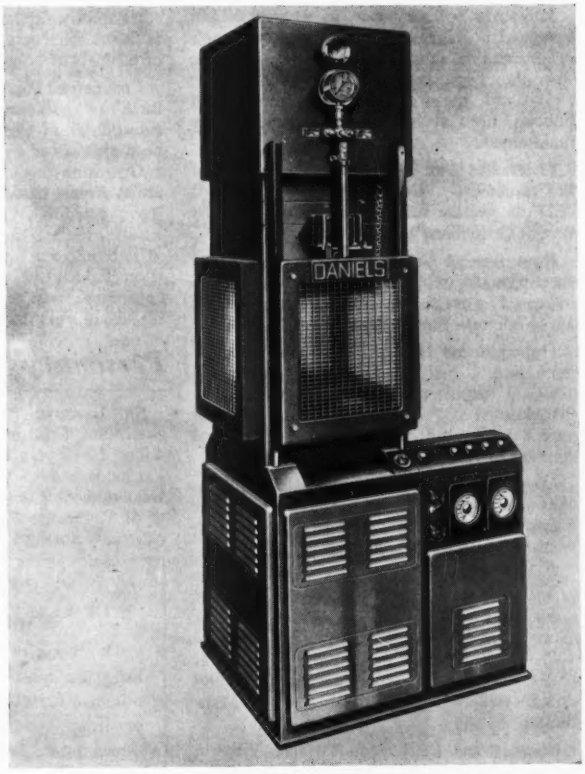
Moulding Sequence

Although the press was designed primarily for alkyd moulding, provision has been made for use with slower curing powders. A camshaft type of timer is fitted behind the panel (17). It is possible to breathe by removing pressure from the mould, although no opening of the mould is possible. When used for alkyd moulding, a sequence timing arrangement is used, a normal cycle being:—

(1) Load press.
(2) Press " Guard and Ram Down " button on panel (4).
(3) Press closes, initiating cure timer.
(4) Cure timer times out, and the press opens.
(5) The guard opens.

The above cycle takes place automatically and, after the pneumatically operated guard has opened, the moulder operates the hydraulic ejector by push button, if the mechanical ejection arrangements are not being used.

The complete cycle may be hand controlled by the push buttons and an emergency stop button is provided which stops the press at any part of the cycle.



A view of the new Daniels press.

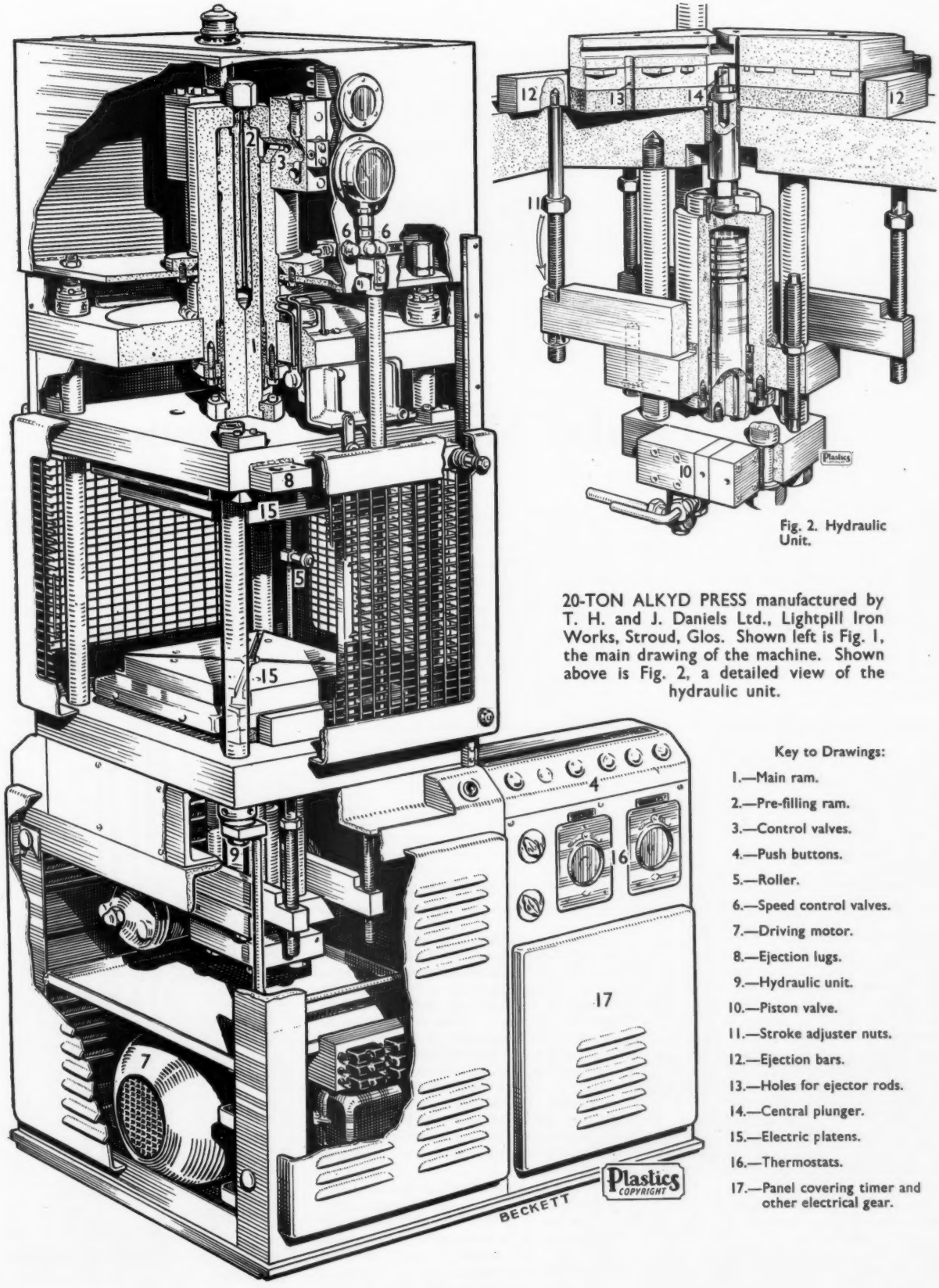


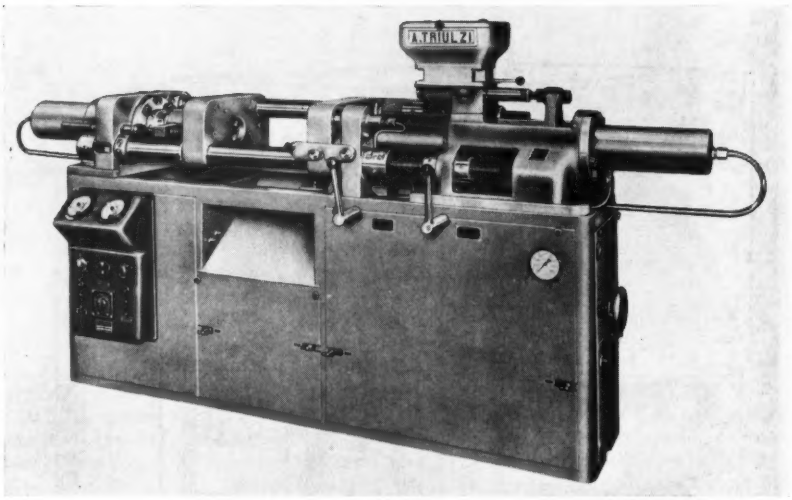
Fig. 2. Hydraulic Unit.

20-TON ALKYD PRESS manufactured by T. H. and J. Daniels Ltd., Lightpill Iron Works, Stroud, Glos. Shown left is Fig. 1, the main drawing of the machine. Shown above is Fig. 2, a detailed view of the hydraulic unit.

Key to Drawings:

1.—Main ram.
2.—Pre-filling ram.
3.—Control valves.
4.—Push buttons.
5.—Roller.
6.—Speed control valves.
7.—Driving motor.
8.—Ejection lugs.
9.—Hydraulic unit.
10.—Piston valve.
11.—Stroke adjuster nuts.
12.—Ejection bars.
13.—Holes for ejector rods.
14.—Central plunger.
15.—Electric platens.
16.—Thermostats.
17.—Panel covering timer and other electrical gear.

Machines for the Industry



The 35 gram Triulzi injection moulding machine.

A complete range of plastics moulding presses for compression and injection are manufactured by Ambrogio Triulzi of Milan. On the injection side the capacities range from 35 to 10,000 grams and a description of their mechanism is given in this article. The British agents for this company are Alexander Cardew Ltd., 2, 3 & 5 Studio Place, Kinnerton Street, Knightsbridge, London, S.W.1.

The Triulzi Moulding Presses

ONE of the leading plastics moulding machinery manufacturers in Italy is the firm of Ambrogio Triulzi of Milan, whose series of injection machines range in capacity from 35 grams to 10,000 grams, *i.e.* from 1.1/3 oz. to 350 oz.

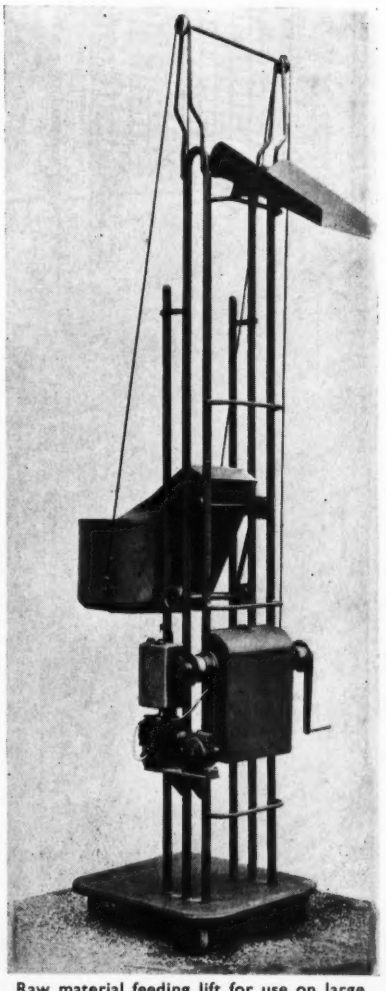
The smaller machines, that is, the 35, 60 and 85 gram models, are of similar design to that shown above. A hydropneumatic system, operating either from its own pump and accumulator or from line pressure, gives a working pressure of 2,130 p.s.i. which is increased to 7,100 p.s.i. by a booster mechanism, fitted to the machine, when injection takes place. The mould locking force is supplied directly from a hydraulic cylinder which moves the mould platen forward. The machine cycle is fast, and mould slamming is avoided by means of a lock cushioning valve which retards the platens at point of contact. A lock safety valve is also fitted to prevent over-reaching by the platen. The whole cycle is controlled by a single operating lever, the other lever is for engaging a dog-clutch that connects the automatic control gear to the distributor valve. This single operating lever for the whole cycle is a feature of all Triulzi injection moulding machines.

		30 gram	60 gram	85 gram
Shot capacity (polystyrene)	oz.	1	2	3
Max. moulding area	sq. ins.	26	33	39
Mould closing pressure	tons	41.3	51.2	61.0
Injection pressure	tons	12.8	15.7	19.7
Size of platens between tie-bars	in.	10 × 10	12½ × 12	14 × 13¾
Distance between open platens	in.	16	16	18
Heating capacity	Kw.	3.5	4.2	4.2
Pump motor	h.p.	10	12.5	12.5

The injection cylinder is made in one piece and is chrome plated internally. The grooved torpedo is also plated. Heating is by hand heaters. The main cylinder mounting is fitted to the main frame of the machine by means of a slide, to allow longitudinal movement to compensate for expansion in the tiebars. The feed block and casting are water cooled. In front of the injection cylinder is a fixed half-platen which serves as the support for the tie-bars and also holds the two small sprue-break hydraulic cylinders. The injection platen, like the mould platen, is free to move along the tiebars the limit of its movement, while the press is in use, being controlled by a link attached to the fixed half-platen. In the mould closed position, the injection platen is held back against the fixed platen and up to the injection cylinder nozzle, which is thus under no appreciable pressure. On the mould opening cycle the two sprue-break hydraulic cylinders move the injection platen to the full extent allowed by the link, thus pulling the sprue clear of the nozzle. This distance can be varied by an adjustment on the link. The injection ram is of nitrided steel and cored for water cooling. It is attached to the hydraulic ram by a bayonet coupling, thus facilitating its removal. The injection nozzle and cylinder are also easily accessible by lifting the links and sliding the injection platen clear. The space available is sufficient for the withdrawal of the cylinder.

Ejection of the moulding is by two ejector bars and a central ejector plate for use when the ejection system is built into the mould. All are operated by the return of the mould platen and can be adjusted and operated independently as required.

Feeding of the raw material is a two stage



Raw material feeding lift for use on large machines.

The 600/900 injection machine. This machine has a normal capacity of 600 grams and 900 grams when using a double, shot mechanism.

operation. The forward movement of the injection ram operates the shot piston which fills the dosing chamber and the withdrawal of the injection ram allows this pre-determined quantity to enter the heating chamber. Access to the dosing chamber for the feeding of additional material by hand is available by a side chute.

In the control panel are automatic temperature controllers and a timer which indicates the injection cycle time and the mould closed time. The machine can be fitted for automatic or semi-automatic cycling if it is so desired. In addition to these controls it is also possible to adjust the injection pressure according to the design of mould and type of material used.

		120 grams	200 grams	300 grams	600 grams
Shot capacity polystyrene	oz.	4½	7	10½	21
Max. moulding area	sq. ins.	46½	77½	170½	233
Moulding closing pressure	tons	75.8	123	246	344.4
Injection pressure	tons	25.6	55.1	70.8	98.4
Size of platens between tie-bars	in.	13½ × 20½	16 × 24	17½ × 28	19½ × 34
Distance between open platens	in.	20	22	28	34
Heating capacity	Kw.	4.2	6.7	9.4	20
Pump motor	h.p.	10	12.5	12.5	16

The Medium Capacity Injection Machines

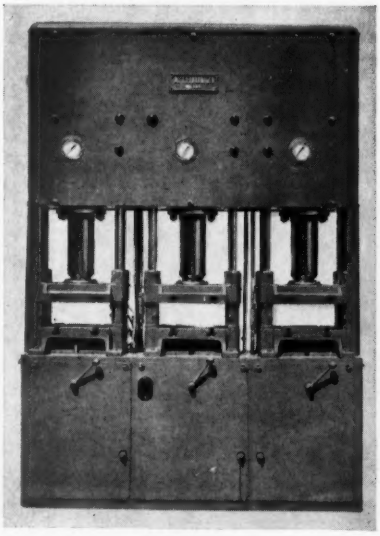
The principal features of the larger machines, *i.e.* the 120, 200, 300 and 600 gram models, are similar to those employed in the small machines. There are necessarily several modifications and additions which will be dealt with here.

The working pressure is, as with the smaller machines, 2,130 p.s.i., but the booster which operates on injection gives only 4,260 p.s.i. Rapid mould closing is effected by jack rams which are independent of the main mould locking ram. A positive opening force is supplied by two push-back rams. The mould platen and injection platen are mounted on four tie-bars supported by a half-platen at the injection end and the main cylinder housing at the other end. All platens are of cast steel. The ejector mechanism is a mechanical one similar to that described previously.

The whole injection unit is mounted on slides and can be moved by means of a screw and crank and after setting is held in position by lock nuts on the extended tie-bars. The injection plunger is returned under pressure supplied by two push-back rams. The locking cylinder is automatically brought under full pressure of 4,260 p.s.i. as supplied by the booster, immediately before the injection takes place. On completion of the injection the booster is cut out and the mould held closed under normal working pressure.

The heating chamber is of chrome plated high tensile steel and is fitted with a grooved torpedo also plated. Band heaters are fitted.

The sprue-break mechanism is operated by a similar technique to that described for the smaller machines as is also raw material feed mechanism. A double shot operation can also be used with the 600-gram machine which will increase its capacity to 900 grams.



(Left) Multiple compression press.

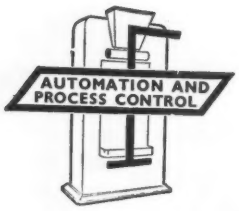
(Right) Low pressure press for reinforced plastics moulding.

Large machines up to a capacity of 350 oz. are also made by Triulzi. As well as the horizontal machines vertical injection moulding machines up to 6 oz. capacity are manufactured.

Compression Moulding Presses

A series of compression moulding presses from 30 to 1,000 tons are included in the Triulzi range of equipment. These presses can be supplied for transfer moulding and for low pressure reinforced plastics moulding. The latter type are of special design for this work having a large platen area with considerable daylight. Another feature of these presses is the use of a mobile lower platen which can be withdrawn from the press by means of a small hydraulic cylinder.

Small multiple compression press units are also produced.



Automation Equipment

In this and the following page we have described a few of the instruments on show at the Instruments, Electronics and Automation Exhibition. Further descriptions of equipment and instruments at this exhibition will be published on this page in forthcoming issues.

Electronic Temperature and Safety Controller. Designed to give a rapid response to temperature changes the Ipco Pyrostat utilizes a thermocouple as the temperature sensitive element. The control is effected by two separate systems. The first consists of a moving coil deflection galvanometer which measures the current generated by the thermocouple and indicates the temperature on the scale. The electronic control system provides a capacity coupling between a vane on the galvanometer pointer and two coils on the control setting arm. The change in capacity as the vane moves operates an intermediate electronic relay which in turn operates the main relay.

The safety controller is similar to the temperature controller except that instead of the electronic control system a depressor, or chopper bar, operated every few seconds by an electric motor, compares the indicated temperature with that of a selected control setting. Should the setting be exceeded the control switch, which in its normal state provides an electrical circuit to a contactor or control valve, is momentarily changed over and breaks the circuit. The system can be adapted to operate various alarms or control motors shutting off the plant.

The Industrial Pyrometer Co., Ltd., Gooch Street, Birmingham, 5.

Timed Programme Controller.—The 350RJ Flex-o-Timer instrument is a "Timed-Programme" type timer consisting of two main sections: a motor-driven time measuring device and an independently driven sequence disc mechanism which controls the operation of the electric or pneumatic functions.

The timing apparatus initiates the motion of the sequence discs, which move quickly through a predetermined arc and carry self-positioning cams that latch and unlatch the functional latch operators controlling either electric or pneumatic functions.

The timing apparatus consists of a large direct reading time dial driven by its own motor. The time dial is equipped with a number of adjustable actuating clamps, the number being the total number of both "off" and "on" functions desired in a cycle up to 20. Each clamp is manually positioned to the exact time at which a function is to be operated.

The cycle range is adjustable to 15 minutes, 30 minutes, 60 minutes, 1 hour, 2 hours, or 4 hours. A 4 r.p.m. synchronous motor is used for all time cycles.

When the timer has completed its desired cycle, the time disc is reset to zero, being turned forward at the 4 r.p.m. speed through the use of a magnet actuated positive clutch and an over-riding clutch. The reduction gears, though by-passed, will continue turning during the reset operation thereby eliminating backlash and resultant loss of timing accuracy during the next timing cycle.

The reset to zero will occur in a maximum of 13 seconds with any time cycle. The minimum recommended time cycle is three minutes and the maximum provided is four hours. The minimum time between the timing clamps is 15 sec. on the 30 min. cycle dial using the single prong clamps adjacent to each other. With the double prong clamps, the minimum time is 7½ sec. for the 30 min. cycle or 15 sec. for the 60 min. time cycle dial. These minimum times may be consecutively produced as often as desired.

The sequence driven mechanism consists of a shaft mounted in self-aligning powdered metal bearings, on which a sequence disc is assembled for each operating function. The sequence disc is die-cast and provides 20 numbered slotted positions for mounting either the "off" or "on" cams.

A cam mounted in a certain numbered position will actuate the latch operator at the time the corresponding clamp on the time dial indicates.

A maximum of eight pneumatic or electric latch operated functions can be provided.

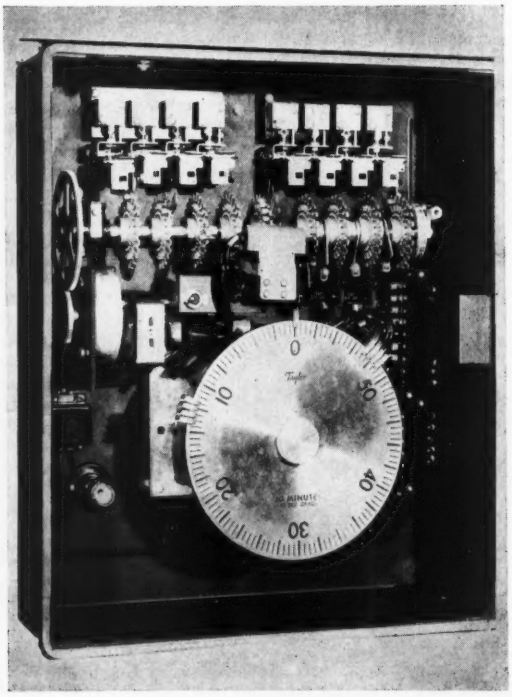
The sequence shaft is driven through a gear reduction by a non-synchronous induction motor which has an average speed of 5 r.p.m., and contains a mechanical braking device which operates when the motor is de-energized.

The timing dial lamps unlatch an operator with micro-switch to complete the circuit to the sequence drive motor. As the sequence shaft rotates, cams mounted on it relatch the micro-switch to stop the motor. Thus, the sequence mechanism shuts itself off after a pre-set rotation. The normal rotation of the sequence shaft is 15° but very quick sequence functions may be obtained by allowing the relatching disc to rotate by larger increments of 15°. Functions may be operated in 1 sec., time increments up to 10 secs., or more as desired.

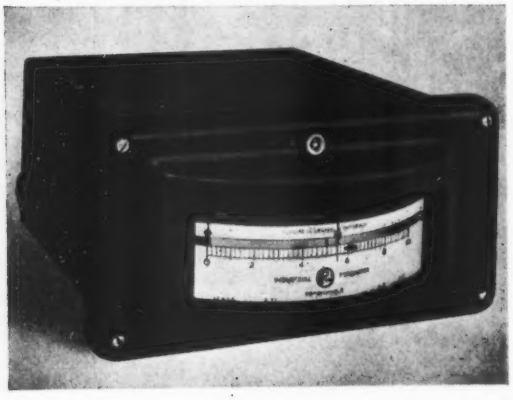
All zero start position functions are actuated within ½ sec. from the instant the timer is started. Cams set in the same numbered position on several sequence drums will actuate their associated functions within 1/5 sec. of each other. Thus, the need for a starting solenoid and its associated mechanism is eliminated.

*Taylor-Short & Mason Ltd., Hale End Rd., Walthamstow, London, E.*17.

(Right) The 350RJ Flex-o-Timer, timed programme controller.



(Below) The Ipco Pyrostat temperature control instrument.



The Kent Synchronous Converter.

Synchronous Converters.—The Kent synchronous converter is basically a single-pole double-throw switch that operates continuously at mains frequency. It is designed primarily for converting small direct currents into proportional alternating signals for easy drift-free amplification. It can also be used for the phase-sensitive rectification of small alternating currents, or for both purposes simultaneously.

Action of the converter is as follows. A soft-iron armature, carried on a beryllium-copper reed, is vibrated at mains frequency by the combined action of a permanent magnet and an energizing coil. Contacts attached to the reed engage with two others mounted on light flexible blades and pre-loaded inwards against adjustable stops. This arrangement eliminates contact bounce and enables the "make" periods to be pre-adjusted independently to any setting. Four standard settings are available, and the converter is offered for operation on mains frequencies of 40, 50 and 60 c/s, the construction differing only in the thickness of the central reed.

Connection to the coil is by way of a separate plug and socket on the top of the unit, and the coil is wound on a metal bobbin which screens it thoroughly from the contact members. These features combine to keep stray currents below about 10-11 amp, and render the converter very suitable for use in high impedance circuits.

Two additional contacts are provided which may be used to increase conversion efficiency at higher voltages.

George Kent Ltd., Luton, Beds.

Timers and Delay Switches.—The Elcontrol timers and delay switches comprise a range o industrial units for automatic control of timed repeat operations. As they are all electronic units, the repetitive accuracy is high—of the order of ±2%—and is not materially affected by wide variations of mains voltage.

They are suitable for timing intervals of up to 300 seconds. Intervals in excess of this call for increasingly bulky components, and also introduce decreasing repetitive accuracy, the use of synchronous motor timers for intervals longer than five minutes is therefore advised.

The Elcontrol timers and delay switches are based on the standard principle of electronic timers, *i.e.* that the time taken for a condenser to charge or discharge through a resistor depends on the values of the condenser and resistor and on charge or discharge voltage. This discharge current is used (directly or indirectly) to energise the relay in the timer.

The units can be divided into two main types: Single stage timers, in which the time interval starts on completion of the initiating circuit, the timers being reset and ready for the next operation after the end of the timing interval and after the initiating circuit has been opened, and cyclic timers in which the time intervals are repeated indefinitely as long as the initiating switch remains closed.

Elcontrol Ltd., 10 *Wyndham Place, London, W.*1.

Automatic Control Meters.—Automeasure has been developed for use in the process industries to accurately control batch quantities of liquids. The dial of the meter, which can be calibrated to suit most requirements, registers the flow of the liquid. When the required quantity has been passed an adjacent valve is automatically closed. For emergency stops there is a trip button which closes the valve after which the same batch can be resumed by pressing the valve lever. This meter is available with pre-set ranges from 0–500 to 0–50,000 gallons giving minimum delivery of 1 to 100 gallons respectively. For smaller delivery and flow quantities a junior model worked on similar principles is available, the smallest of this series having a pre-set range from 0–50 pints with a minimum delivery of 1 pint.

Two electrical models are available. The EP-2 has the electric pre-set dial directly mounted on the meter but the control valve can be placed some distance away. The EPR-1 has an electrical contacting head on the meter and the pre-set dial can be panel mounted where required. The control valve may also be placed at any suitable point in the line.

Tylors of London Ltd., Bright Works, Victoria Road, Burgess Hill, Sussex.

Precision Speed Indicator.—The Maxwell Indicator has proved invaluable in many installations where guaranteed measurements, accurate to 0.1%, are required. It is essentially a frequency meter, and its basic principle is that of the Wheatstone Bridge. One arm of the Wheatstone Bridge circuit is replaced by a special high-accuracy-type mica capacitor having a nominal value of 0.15 microfarads. This capacitor is charged and discharged through a rapid-acting relay the number of charges per second being dependent on the frequency transmitted from a generator coupled to the machine of which the rotation-speed is to be measured. The generator frequency may be as high as 250 cycles per second, and the circuit components are so arranged that the capacitor becomes fully charged; therefore, the mean strength of the signal passed on to the measuring circuit in any given small period of time is proportional to the frequency of the generator, or to the speed of the machine driving the generator.

As in the Wheatstone Bridge, the galvanometer reads zero when the bridge arms are balanced; in the case of the Maxwell Indicator this occurs at a frequency, or speed, predetermined by the values of resistances and of a capacitor. Instruments are normally supplied with four sensitive ranges for speed measurements, these four "balance" speeds are arranged to divide equally the total speed-range covered by the instrument.

At speeds other than "balance" the galvanometer is deflected in proportion to the difference between the actual speed and the "balance" speed. Full-scale deflection is arranged to correspond to the next higher "balance" speed in the sequence; thus an instrument covering a total range of 0–4,000 r.p.m. has successive balance points at every 1,000 r.p.m.

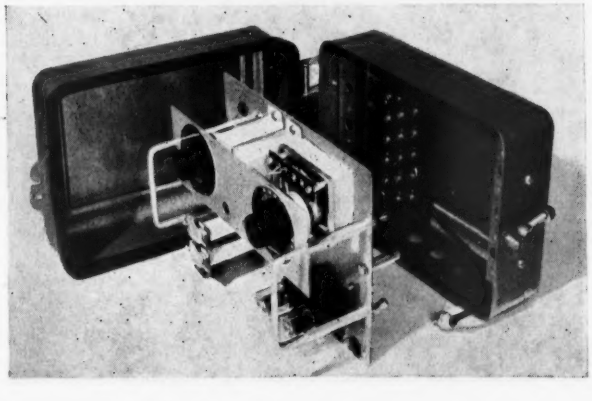
A sensitivity control is fitted giving an accuracy of 0.1% of the full scale value.

Release of the sensitivity switch causes the speed to be indicated on the total scale to within 0·5% accuracy.

The British Thomson-Houston Co. Ltd., Coventry.

(Right) The Maxwell precision speed indicator.

(Below) The Elcontrol cyclic timer showing the chassis and plug-in-type connectors.



Machines for the Industry

New H.F. Welding Machine

PLASTIC welding is now established as an industry in its own right, but whereas the needs of earlier industries for machine tools was able to be met by mechanical engineers, this new and rapidly expanding industry demanded machine tools designed by mechanical engineers working in unison with electronic engineers. The combination was not easy. Conflicting design requirements had to be reconciled, and above all, since neither of these specialists, by virtue of their calling, were versed in the art of plastic welding on a commercial basis, a third element was necessary—practical specialized welding experience.

One of the earliest workers in this field has recently put into production, at his factory in North London, the first high frequency welding machine to be designed by the company he started 3½ years ago. H.F. Industrial Services Ltd., 317–319 High Road, London, N.22, have called this machine the Acme No. 1, and a description of it follows here.

Mechanical Features

The press, of cast machine tool construction throughout, can exert up to 400 lb. pressure, more than double conventional pressures. At 250 lb. the effort required to operate the foot pedal is only 15 lb., applied at the commencement of the stroke. No foot pressure is required during the weld cycle. Pressure is adjustable from zero upwards merely by rotating a small lever, and without in any way upsetting the levelling adjustment of the electrode.

The action of the press may be changed in a matter of seconds to that of a light quick-acting press for small, short cycle jobs.

The stroke is 2½ in., but this may be reduced progressively to the minimum required for a particular job in order to minimize operator movement.

Provision is made to incorporate an air cylinder as a direct replacement for one of the links in the lever system at any subsequent date.

The "V" slide principle, common to all machine tools where accuracy, rigidity and long life are essential, is incorporated in the electrode mount. The mating surfaces are ground cast steel and are the only bearing surfaces requiring lubrication. Self lubricating bushes are fitted in every other bearing and need no attention whatever throughout the life of the machine.

The depth of penetration of the electrode is controllable by a knurled micrometer screw calibrated directly in thousandths of an inch.

A range of interchangeable lower platens and fixtures is available and "pads" are already machined flat and level in the cast bed. Three point fixing is employed to avoid distortion.

Machined "face pads" are similarly provided so that future appliances, such as forward sliding tables, or process attachments may be bolted direct on to the front of the cast bed.

A range of interchangeable mounts up to 40 in. long is available, all of which incorporate levelling screws located over a broad basis for ease of adjustment. No spigots, shanks or brackets are required on the backs of electrodes. They are merely plain flat backed, with consequent reduction in cost, but existing electrodes from any other machine can be readily accommodated. There is no minimum height limit and the maximum is 4 in.

Rubber footed clamps, and "T" slots enable stops, frames or jigs to be accurately and firmly located anywhere on the work table.

Built-in provision is made for "applique" or multi-colour relief embossing and gold blocking. A range of units for this purpose is available. This feature also greatly facilitates the welding of cellulose acetate and rigid p.v.c., for which the frequency is well suited.

Rubber wheels at the generator end facilitate manœuvring into position, whilst the legs on which the equipment normally rests have rubber feet.

A drawer is provided for small tools, etc., and the work table is hard plastic covered in a dull surface to avoid reflection of overhead lights into the eyes of the operator.

Electrical Features

Much has been heard of "flash or arc limiters," a tacit acceptance of the probability of this distracting and costly occurrence. The designer of this new machine has consistently maintained this to be the wrong approach. The flash hazard should be eradicated, not the consequences limited.

The development of a fundamentally new circuit, providing a higher frequency than any hitherto employed commercially has eliminated flash hazard for all practical purposes. Tear-seal electrodes completely "overhanging" the work by 6 in. have produced no flash or burn.

Welding power is as readily controlled, there being no "tuning." An instantaneous operating electronic overload trip is fitted. This is infinitely variable so that on small jobs, when welding metallic or carbon black printed material, it may be set just above the normal load current and will operate as soon as *surface discharge commences*, and well before any barrier material in use would have been completely burnt through, as demanded by conventional "flash limiters."

A synchronous motor type welding time unit is fitted. This is calibrated accurately in tenths of a second and is absolutely repetitive.

A resetable Veeder counter is incorporated, which records only completed weld cycles. Prematurely terminated welds are not recorded.

An adjustable work light is provided which extinguishes at the end of the welding time and re-illuminates as soon as the foot pedal is released.

An over-riding safety switch, and in addition a jack socket is fitted. This enables manual control by push-button to be exercised as necessitated by certain processes, or as an interlock with future auxiliary equipment or jigs. It also makes provision for interlocking the control circuits with automatic continuous pneumatic operation merely by inserting a plug.

A magnetically actuated circuit breaker is combined with the main switch and replaceable fuses are dispensed with.

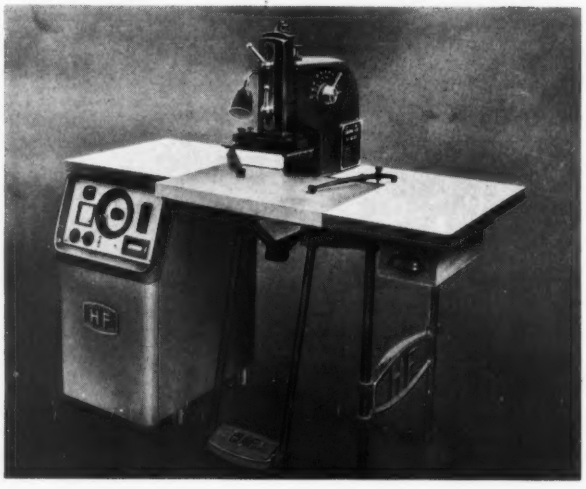
Television equipment under Post Office supervision on both B.B.C. and I.T.A. services, have been operated without interference in the same room.

A gate switch fitted to the quickly detachable access panel is identical and interchangeable with that operated by the foot pedal. When this ultimately fails, a spare is ready to hand.

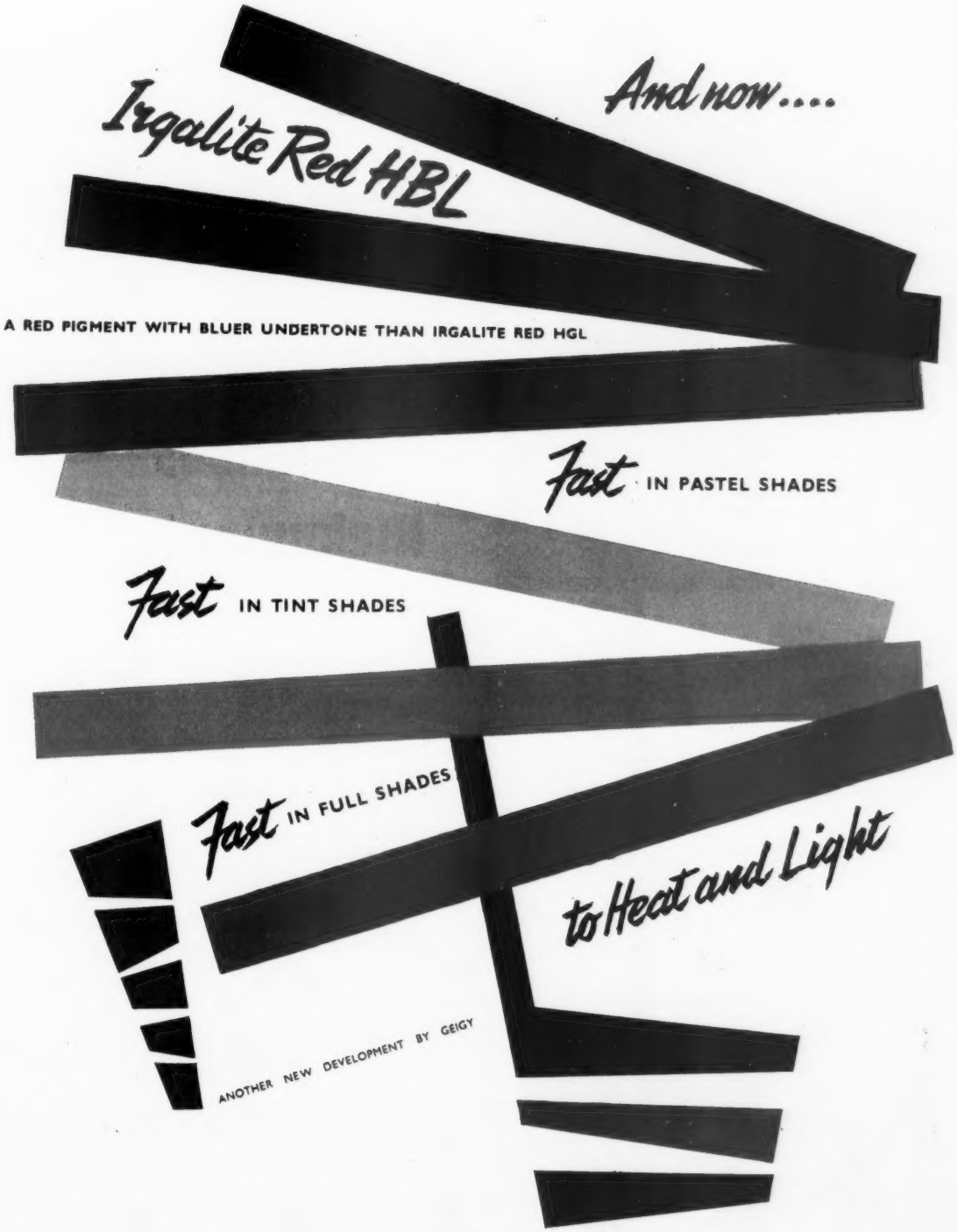
Ingeniously ducted convection cooling is employed and there is no fan or air filter to require attention. The machine is quite silent in operation.

Specification

Standard voltage: 200–250 volts A.C., 50 cycles, single phase.
Maximum current: 15 amps.
H.F. power output: 1.5 kW.
Press operation: Foot or pneumatic.
Press stroke: 0 in. to 2½ in.
Daylight adjustable: 0 in. to 4 in.
Throat: 7½ in.
Pressure adjustable: 0 lb. to 400 lb., by lever.
Platen size: Standard 22 in. × 15 in.
40 in. × 6 in.
Table: Height 33 in., length 54½ in., depth 25¼ in.
Overall height 51 in.
Weld area on double thickness 0.018 in. p.v.c.—8 sq. in.
Weld length $\frac{1}{16}$ in. wide tear seal double 0.018 in. p.v.c.—80 in.



The new Acme No. 1 high-frequency welding unit designed and built by H.F. Industrial Services Ltd.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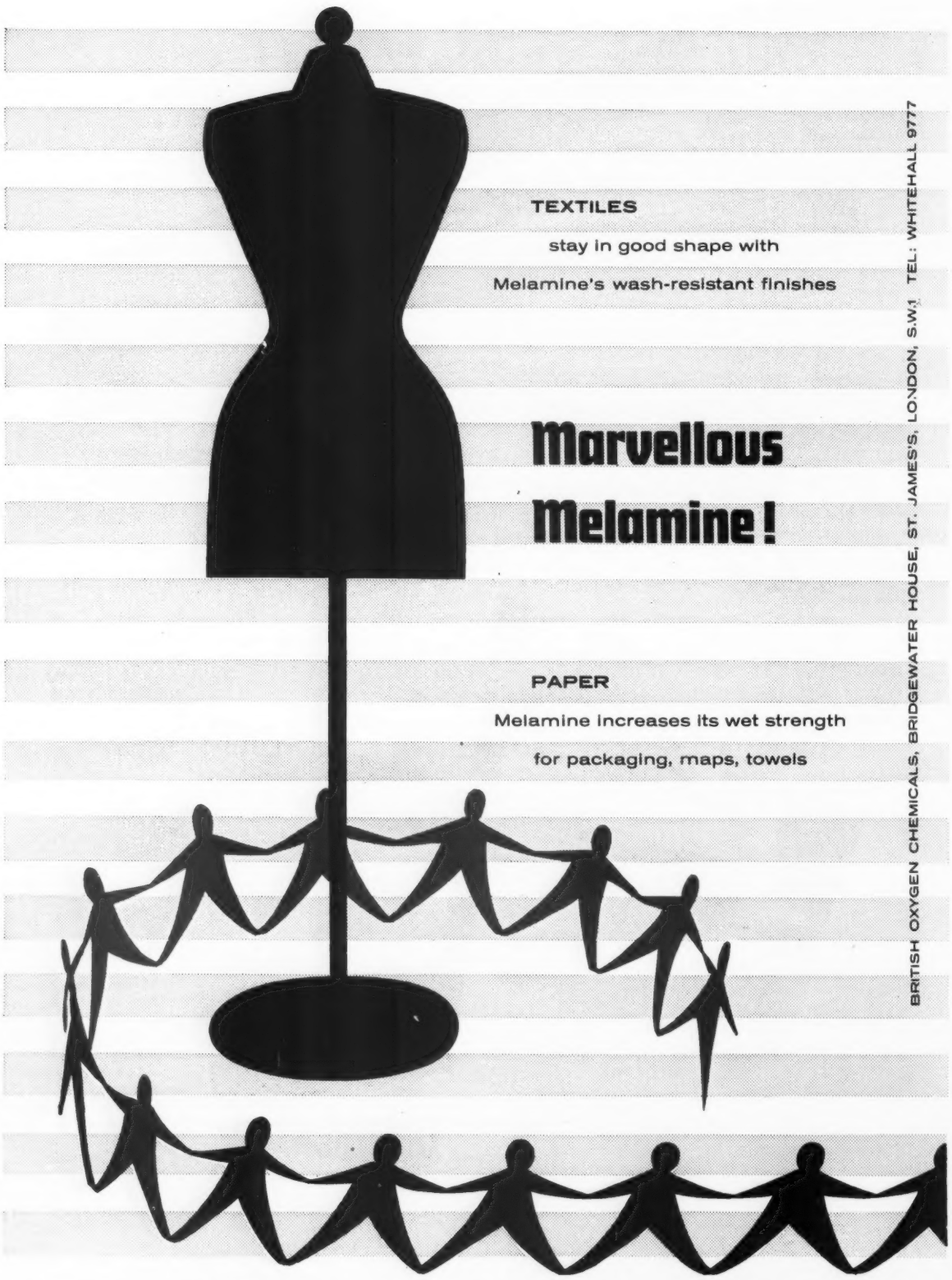
to Heat and Light
ANOTHER NEW DEVELOPMENT BY GEIGY

Plastics Chemicals Division
THE GEIGY COMPANY LTD. Rhodes, Middleton, MANCHESTER

P 39



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TABLEWARE · DECORATIVE LAMINATES · FABRICS · PAINTS · PAPERMAKING

TALKING SHOP . . .

Railway Mania. Just lately I have spent a lot of time in the care of British Railways, of whom I speak very warmly. Excepting station buffets, B.R. do a pretty good job of work, and I was therefore sad to be precipitated into a hiatus of positively frightening proportions. It was this wise: travelling to Harrogate, to the Reinforced Plastics Conference, I caught the 4.50 Tees–Tyne Pullman which rushed me up to York in 3 hours 13 minutes, at nearly 60 miles an hour. There followed a wait on York Station of *thirty* minutes, enlivened only by a distant view of York Minster between a gap in the buildings, before onward transmission to Harrogate. Bathos isn't the word for it.

* * *

Dutch Company's Profits Lower. A report in the *Financial Times* for May 13 stated that profits of A.K.U., N.V., Arnhem, had fallen from Fls. 32.9m. to Fls. 25.8m. Whilst maintaining the 12% dividend, the additional 3% tax-free bonus distributed last year is omitted.

Many chemical companies have been similarly hit this last year, due mainly to increased costs rather than a diminution in sales. Monsanto Chemicals Ltd., have just reported sales of £14 million, a 4% increase on 1955 figures, but the net profit is 13.7% down. Buoyancy of chemical shares remains, however, unaffected. The forward planning programme for new plant is indication enough that the industry is still on the growth curve, as indicated by the new I.C.I. butanol plant at Billingham, costing more than £1 million, which has just gone on stream, and expenditure last year by Monsanto of £2¼ million all told on new capital projects.

* * *

Portable Cinema. Andrew Smith Harkness Ltd., have developed a portable cinema 80 ft. long, 35 ft. wide and 18 ft. high, according to a report in the *Kinematograph Weekly* issue for May 9. The framework is tubular steel, and the covering is p.v.c. sheeting. Six men can erect it, and it weighs, when packed for transport, 2½ tons. The Army Kinema Corporation have two in use in Cyprus. Perhaps also garden parties and flower shows will suffer a change from the traditional English marquee (remember the compound aroma of wet grass and tea?) to the slick gale-proof all-plastic portable hall.

* * *

Mr. S. C. Hart-Still has recently been appointed to the teaching staff of the Chemistry Department of the Borough Polytechnic, with special responsibility for plant and equipment used in the plastics industry. Mr. Hart-Still, who has been actively engaged in the plastics industry for almost 20 years, has been visiting lecturer in plant and moulded design at the Borough Polytechnic for 14 years, and has also lectured at the National College of Rubber Technology.

He first became interested in plastics materials when working in the aircraft industry prior to the war.

* * *

B.I.P. House Journal.—I have just received number seven of the *Beetle Bulletin*, the house organ of British Industrial Plastics Ltd. No doubt it will make as much of an impact on its general readers, when it is issued shortly, as did my advance copy on me. For whilst one has come to expect a high standard of production in B.I.P. literature, the standard set with this latest *Bulletin* will take a lot of beating. The colour printing especially is of a very high order. The whole production is well in keeping with the policy of the company's managing director, Mr. C. H. Glassey, which is to set the highest possible standards in quality and service. The *Bulletin* has been prepared by Central News Ltd.

* * *

Eighth Institute Annual Lecture. Sir John Dean, B.Sc., A.R.I.C., F.I.R.I., delivered the Eighth Annual Lecture of the Plastics Institute at the Institution of Electrical Engineers, Savoy Place, on Tuesday, 30th April, 1957. His subject was "Thermoplastics in the Submarine-cable Industry." Sir John described the many ways in which plastics have contributed to underwater telecommunications, and the transmission of electric power. He confined his remarks mainly to polythene, but he also included a review of the historical development of gutta percha in relation to submarine cables. The lecture concluded with a brief description of the Transatlantic Cable and its manufacture, after which a new 30-minute colour film on the Cable was shown for the first time to a major audience.

* * *

Russian Visit. I was at the cocktail party given by the British Plastics Federation to welcome the Russian delegation the other evening. The atmosphere of good comradeship and well-being was in the best traditions of British hospitality and I am sure our guests, despite the handicap of language must have felt welcome indeed. The high-spot of the evening was provided by Mr. Cyril Last who, with considerable aplomb, rose and proposed a toast to the guests and the U.S.S.R. in Russian. Which I think was a very nice gesture indeed. A Russian official afterwards said it was very good Russian too!

The delegation has been over here studying our industry, especially to see what it can offer in the way of machinery, particularly automatic plant, and what it can suggest in the way of new applications for plastics materials. The Russian's very full itinerary, made more crowded by their arrival a day late, can only have covered a small section of the plastics industry, but nevertheless, it may have been sufficient for them to report favourably to their superiors.

* * *

Borough Recognized for Hives Awards. In industrial and educational circles in recent years there has been much talk about the Diploma of Technology, a product of the Hives Report, which is to be granted to students at certain technical colleges. The Diploma is to be the equivalent of a university degree, and a number of non-university teaching centres are being up-graded to provide the necessary training. It has just been announced that the Borough Polytechnic's four year sandwich course in chemical technology with special reference to plastics technology and high polymer science, has now been accepted by the (Hives) National Council for Technological Awards as one suitable for the award of the Diploma in Technology.

All the courses recognized by the Hives Council must reach the equivalent of Honours Degree standard with an emphasis on problems of production and administration. Thus the Borough Polytechnic which was the pioneer in plastics education in the United Kingdom, is now able to offer the equivalent of a degree course in plastics technology.

Certain special features of the course deserve emphasis:

(*a*) Students will spend alternate six monthly periods in college and in industry over four years.

(*b*) All students will follow courses in the main branches of chemistry and will reach at least the standard of Part I of the Graduateship of the Royal Institute of Chemistry by the end of their third year.

(*c*) In the second year onwards students will devote a considerable amount of time to the study of Plastics Technology and in the final year there will be special stress on the Organic and Physical Chemistry of High Polymers.

(*d*) Chemical Engineering is to be regarded as an important ancillary subject.

(*e*) Provision is made for "Liberal" studies, for example, through courses in a foreign language and in economics.

(*f*) Students will reach a standard of A.P.I. or beyond in Plastics Technology.

For those who would like further details, write to the Head of the Chemistry Department, Borough Polytechnic, London, S.E.1. The Polytechnic authorities hope that firms in the plastics industry will agree to second students to the course.

* * *

Duthane. An interesting new material has been announced by the development division of the Dunlop Rubber Co. Ltd. Belonging to the polyurethane family, i.e. based on isocyanates, and called Duthane, the material is characterized by high abrasion and tear resistance, very high tensile strength, low compression set-high damping, high resistance to petrol and oil, high ageing resistance, and excellent bonding. Additionally, the properties remain unchanged between —20° C. and + 120° C.

Duthane is to be marketed in three grades of hardness, hard, medium and soft. In the hard range (95 BSD — 80 BSD) possible applications include gears, in place of cast iron, bushes, where lubrication is difficult, and components, where dynamic fatigue is important. The following table has been issued covering the electrical and oil resisting properties of the hard grade:—

Electrical Properties

Surface resistivity ..	10 in.—5×10^{10} ohms
Breakdown kv/mm ..	18–21
Dielectric constant at 10^6 cps.	6.4–7.1

Oil Resistance

DTD 585	2% increase in vol.
D.Eng.RD.2487(EEL3)	2% increase in vol.
E.Eng.RD.2472 B/0 ..	—0.5% to + 0.5% increase in vol.
KER 210B	7½% increase in vol.
Skydrol 500	100% increase in vol. (25% at 25° C. for 3 weeks)

It will be interesting to see how this new range of materials develops. Meanwhile, Dunlop technologists are anxious to discuss potential applications with interested technical people in industry.

PLASTIKON.

Automotive Engineering with Urethane Foams

A report of a paper read recently before the Society of Automotive Engineers of America.

INCREASING use is being made of polyurethane foams in the automotive industry in the U.S.A. Approximately 8,000,000 lb. of foam were manufactured for use in all industries in 1956. Both rigid and non-rigid foams are being made as moulded items and in slab form. In the non-rigid field, the U.S.A. automotive industry is using moulded foam-padded instrument panels generally in their 1957 models. Foam-covered, pre-trimmed arm-rests and drive shaft tunnel support pads are also being moulded. In addition, fabricated seats are being prepared from slab stock made from polyesters. In the semi-rigid and rigid fields, foam insulated heater housings are being moulded for use by one automotive manufacturer. Rigid foam slab stock is being fabricated into impact resistant sun visors for another company.

The present applications for polyurethane foams in the automotive industry can be classified generally into crash protecting, vibration dampening, and insulation type uses.

One of the largest single potential markets for this foam, however, is its use as a seating material. At present, no significant penetration has been made in this field. Progress has been delayed because the initial results of seating tests using the early type of polyester foams, in many instances, were disappointing. These results can usually be traced to the fact that originally only one general type of polyester foam was commercially available. Thus, it was submitted for every type of evaluation without regard for the requirements of the specific application. Some of the results of these tests were described recently before a meeting of the Society of Automotive Engineers Inc. by R. H. Walsh of the Elastomers Laboratory of E. I. du Pont de Nemours & Co.

Specifications for Seating Materials

In evaluating a seating material, comfort is the fundamental specification by which it is judged. To many people, comfort is made up of both physical and psychological factors. For example, softness is associated with comfort and therefore the first feeling of a seat upon use must be soft or down-like. As the weight of the body sinks into the cushion, there must be a gradual and increasing resistance to penetration so that the body practically is cradled in the cushion. The seating material must also have sufficient compression resistance left to prevent bottoming during a severe bounce. Under dynamic conditions, the seat must also minimize side sway and road vibrations during use.

The appearance of the finished upholstered unit must also be attractive. The fabric must not hammock after use of the seat or the welting ride away from the edge of the cushion. It is also essential that neither the upholstery fabric nor the seat become fatigued and sag after multiple flexings.

Numerous modifications must be made usually in a new seating material before all of these properties are incorporated in a single unit. Development of suitable urethane foams has been no exception.

In the foam field, a number of standard physical tests have been found that appear to correlate with the performance characteristics of a seating material. These include its compression deflection, hysteresis, strain decay, resilience, and flex fatigue properties. These characteristics of various types of urethane foams will be described, using the properties of natural rubber foam as controls.

Load Deflection Properties

The load deflection curves for foam made from rubber latex (6.1 lb./cu. ft. density) and a urethane foam (2.5 lb./cu. ft. density) made with a polyester resin indicate clearly that urethane foam has an initially high modulus, or, in practice, a crisp, harsh feel. A plateau section follows where only slight additional weight deflects the foam from 15 to over 40% of its height. This results in a feeling of sinking into the cushion. The final third of the curve shows a rapid rise in the load required to deflect the foam the last 25 to 35%. However, this load is only approximately one-half the value of natural rubber foam at 80% deflection and results in the urethane foam bottoming more easily.

It is possible, however, to change the shape of the load deflection curve of urethane foams in at least three ways: the type or chemical composition of the starting polyol can be changed; the foam can be compounded with modifying additives, or it can be cut and shaped mechanically to modify its properties.

As an example of the first method, polyether resin can be substituted for the polyester as the starting polyol. The curves produced here were for urethane foam made from two different polyether resins, a polypropylene glycol based resin, and Teracol.* Both curves show an initially low modulus and parallel the natural foam control curve through 50% deflection, eliminating the plateau section common to polyester foam. Beyond this point they fall below the control curve, although Teracol foam has a higher compression than the other polyether.

Fortunately, recent work has shown how to raise substantially the last third of the compression-deflection curve. Small amounts of an elastomer are added to the foaming composition preferably as a latex. The effect of adding 2 to 3% neoprene is very interesting. The curve for Teracol based foam at 2.5–2.7 lb./cu. ft. is actually higher than that of natural foam, and at 2 lb./cu. ft. density, only slightly lower. The other polyether based foams also follow the rubber curve closely.

Latex can also be used with polyester resins. When added to a polyester foaming composition compounded with the proper emulsifying agent, catalyst and plasticizer, the load deflection of the foam (2.5 lb./cu. ft.) approximates the shape of the rubber control curve.

Of course, it is obvious to the engineer that other modifications can be made also in the load deflection properties by mechanical means. The foam can be shaped by either convolute cutting or geometric cutting with a Fecken-Kirfel machine.

* Du Pont trademark for polyalkylene ether glycol.

Hysteresis

In experiments the hysteresis properties of a foam and its rate of recovery after use can be correlated. Foams with a slow recovery rate usually have a high hysteresis or energy loss. Under ordinary use conditions, this results in the upholstery fabric "hammocking" as the body weight is removed from the seat.

The original polyurethane foams made from available polyesters had high hysteresis properties and hammocked badly. Natural rubber foam has low hysteresis characteristics and perform satisfactorily in use. Urethane foams made from polyethers have hysteresis properties comparable to natural rubber and perform well in use tests. The improved types of foams made from compounded polyester resin also have much better hysteresis properties. Test data comparing the various types of foam are shown in Table 1.

TABLE I

HYSTERESIS PROPERTIES OF URETHANE FOAM

Material	Density lb. cu. ft.	Energy loss, %
Urethane foam, uncompounded polyester	2.7	49
Urethane foam, compounded polyester	2.6	29
Urethane foam, polyether resin	3.0	20
Urethane foam, Teracol resin ...	2.5	17
Natural rubber foam	6.0	15
Steel springs		0–10

The hysteresis values were calculated by measuring the areas under the loading and unloading curves of a compression-deflection test carried to 80% deflection. Then per cent energy loss, or hysteresis =

$$\frac{\text{area under loading curve-area under unloading curve} \times 100}{\text{area under compressed curve}}$$

Strain Decay

Seating tests made with urethane foam cushions have all included reports of adverse comments on the feeling of continually sinking into the cushion during use. The effect has been attributed to the plateau-like compression characteristics of this foam. However, foam compressed to deflections of 60 to 70%, which is beyond this area, also exhibit the same feeling. This suggests that the effect is more properly a strain decay phenomenon. Foams made from compounded polyethers, Teracol, and polyester resin show less tendency to undergo strain decay than uncompounded urethane foam, and have properties similar to natural rubber foam. Typical data from strain decay experiments are shown in Table 2.

Some of the experimental fully moulded urethane cushions have sometimes exhibited a similar sinking feeling as to that associated

TABLE 2 STRAIN DECAY PROPERTIES OF URETHANE FOAM

Material	Orig. Height at 25% deflection, in.	Height after 1 min. dwell, in.	Orig. Height at 50% deflection, in.	Height after 1 min. dwell, in.
Urethane foam, uncompounded polyester...	0.75	0.62	0.50	0.40
Urethane foam, compounded polyester ...	0.75	0.70	0.50	0.45
Urethane foam, polyether resin	0.75	0.72	0.50	0.47
Urethane foam, Teracol resin	0.75	0.72	0.50	0.47
Natural rubber foam	0.75	0.73	0.50	0.48

NOTE: The same samples identified in Table 1 were used for these tests. A 15 in. × 15 in. × 1 in. sample was used in this test. It was preflexed three times to 75% deflection, allowed to stand for 5 minutes, then compressed using a 50 sq. in. standard RMA foot to 25% deflection. An immediate compression reading was taken, and again after 1 minute. The test was repeated at 50% deflection.

with strain decay. It is not, however, the same phenomenon. It results from the presence of a tight, heavy skin on the foam which holds air in the cushion producing a pneumatic effect. It can also be caused by the presence of closed cells in the foam. In both cases there is a feeling of continued settling into the cushion as the air is slowly expelled during use. In the first case, use of a mould lubricant which produces a thin, open skin, or mechanical or electrical piercing of the foam surface, allows the air to escape rapidly and eliminates the problem. The second condition can be corrected by rupturing the closed cells during manufacture.

Resilience

Resilience tests are used to characterize the liveliness of a seating material. A correlation may exist also between resilience measurements and the tendency of a seat to side-sway. Tests have shown that cushions with low resilience have less tendency to sway. The lower resilience, as compared to rubber foam, of urethane foam made from polyesters was expected to solve this problem but the slow recovery rate of these foams proved a psychological block, which has not as yet been overcome. To many people, a good seating material must still feel lively.

The resilience of foam made with polyester resin can be increased substantially by the same compounding techniques previously outlined. The resilience of foams prepared from the polyether and Teracol resins, while not numerically equal, are in the same class as natural rubber foam. Typical data are shown in Table 3.

TABLE 3

RESILIENCE PROPERTIES OF URETHANE FOAMS

Material	Resilience, %*
Urethane foam, uncompounded polyester	35
Urethane foam, compound polyester ...	50
Urethane foam, polyether resin	50
Urethane foam, Teracol resin	59
Natural rubber foam	62

* A.S.T.M. Method D.

Flex Life

Flex tests conducted on foams according to A.S.T.M. D1055–49T at 50% deflection showed various rubber foams to decrease between 5 and 20% in compression properties after 250,000 flexings. Urethane foams also varied in their resistance to flexing. If properly cured, the changes in compression ranged between 10 and 35% using the same test.

Of late, there has been interest in modifying the flex test by increasing the deflection from 50 to 75 or 90%. This change has been suggested as being more characteristic of many actual use conditions.

Initial tests on Teracol based foams showed that some samples were no more affected by the more rigorous test conditions than when run at the original deflections. Two main factors were found to influence the performance of a foam in the test: the amount of tack developed between the cell walls during flexing and the state of cure of the foam sample.

Tack can be minimized by the use of an ester plasticizer and by the proper choice of surfactants for the foaming composition. A full cure is obtained in urethane foams when all the isocyanate, water, and resin have reacted. In the case of Teracol this is best accomplished by heat curing in the presence of some moisture.

Aging

Hydrolytic Stability

The best upholstery material must age satisfactorily or it is of no practical use. Over the last year the aging properties of urethane foams have received wide study and much discussion. In several cases polyester foams have failed to give satisfactory performance, becoming soft in only a few months of service. These have been isolated cases and not typical of the class. These experiences have demonstrated, however, the need for care in preparing these foams.

Hydrolysis of the urethane and urea links in the polymer was found to be the cause of poor aging of foam. This degradation is catalyzed by acid or alkaline conditions or the presence of hydrophilic material. Foams with satisfactory aging properties for many cases can be made from the present polyester resins by close control of the reactants during foaming. Further improvements in the aging properties of foams can be made by the use of hydrophobic polyols.

Natural aging tests have only been started on the improved types of foams during the last three years. So far they have aged well. On the basis of accelerated test, it is believed that these foams should perform satisfactorily for at least 15 or 20 years of normal use.

Elevated Temperatures

Urethane foams perform very well as elevated temperatures. Both polyester and polyether foams age satisfactorily at temperatures as high as 240° F. (which normal operating conditions do not usually exceed).

The Future

While not as yet commercially operable, several new laboratory techniques have been developed. One is a process for producing thin laminated sections of resilient foams and other coating materials. It is based on the use of a delayed action catalyst. As little as .015 in. of polymer is knifed on to vinyl, paper, fabric, or metal, and heat activated to produce a uniform fine cell foam approximately 0.25 in. thick at 4 lb./cu. ft. density. Such a technique suggests the possibility of using these combined materials as insulating liners for cars among many other applications.

An attractive uniform layer of either resilient or rigid foam at thickness as low as $\frac{1}{8}$ in. can be sprayed even on to a vertical surface with two new different types of spray guns, great uniformity being obtained. The technique can be used to insulate and provide structural strength to car parts.

Improved resins for rigid foam have been evaluated which can resist operating temperatures in excess of 300° F. and which are strongly flame retarding.

Today, present application for urethane foams in automobiles, if combined in a single model, would total 4 lb. Potential applications for urethane foams in tomorrow's car exceed 24 lb. These include fully moulded seat units, headliners, foam-backed upholstery for sidewalls, doors and trunk liners, crash protecting devices for the rear seat rider, rug underlays, and rigid foams for sound and heat insulation on the fire wall and under the hood. Foam can be used also as an expanded adhesive on the underside of long spans of metal such as the rear fenders and deck to provide structural strength and sound-deadening properties.

Book Review

Fibres, Plastics and Rubbers.
By W. J. Roff. 400 *pp.*
Published by Butterworth Scientific Publications. Price 63*s.*

Mr. Roff is employed by the British Cotton Industry Research Association, and his undertaking a work on plastics may at first surprise many readers, until it is remembered how much of the chemistry and technology employed in plastics had its beginnings in work in the fibre field. Carothers and Whinfield are but two of the many scientists whose work fundamentally changed the course of polymer history.

This book is essentially intended for those engaged in industrial research and development, where it is frequently necessary to obtain information on a field outside one's own. It is a source book, containing extensive chemical, physical and general information on common high polymers.

In fact, it is a book for which we have long been waiting, an easy-to-use, comprehensive index to materials. The author deserves special praise for the practical and lucid manner in which he has arranged the book's structure, and also for correlating the matter on fibres and rubbers so successfully with the information on plastics.

A short chapter at the end of the book is devoted to historical matter. Comprising only five pages, it is too short to be of value even to the layman, and a similar criticism can, to a lesser extent, be directed to the chapter on fabrication. They do not, however, in any way mar the general practical value of the work as a whole.

The Properties and Testing of Plastics Materials—Part 9 (Concluded)

Industrial Materials—Special Tests, Properties, etc., Polyester Resins, Textiles and Fibres, Expanded Plastics.

This is the last section of this series. The complete work, fully revised, is to be published in book form in July, and an announcement appears elsewhere in this issue.

By A. E. LEVER,* A.I.R.I., and J. RHYS,† M.Sc

Section 15. Polyester Resins.

AN American Specification covers thermosetting moulding compounds consisting of unsaturated polyester resin binders that have been combined with fillers, pigments and other chemical agents (1). The test pieces are compression moulded.

A simple technique for measuring the " gel " time and exotherms of cold-setting polyesters is described (2). Some results are given.

A method is discussed (3) for the identification of dicarboxylic acids in polymeric esters.

An investigation was made (4) on the effect of humidity during fabrication of polyester-fibreglass laminates. A relationship was shown to exist between flexural strength and the percentage of voids, and between light transmission and the percentage of voids.

Properties (1)

(Moulding Compounds)

Type 1. G.P., granular material with mineral fillers.

„ 2. G.P., as Type 1, with cellulose fillers.

„ 3. G.P. putty-type material, mineral fillers.

„ 4. Putty type material, mineral filler, improved electrical properties.

Type	1	2	3	4
S.g.	2.18–2.28	1.6–1.9	1.7–1.9	1.9–2.1
Flexural strength p.s.i. min.	7,500	9,500	7,500	7,500
Modulus of elasticity in bend p.s.i. × 10^6	2	1.3	1.3	1.8
Arc resistance min. sec.	175	125	125	175
Water absorption (24 hrs.) %	0.15	1.0	0.5	0.15

COMPARATIVE PROPERTIES OF REINFORCED POLYESTER PLASTICS AND OTHER MATERIALS (5)

	Polyester Plastics					
	Reinforced with glass rovings	Reinforced with glass cloth	Reinforced with chopped strand mat or preform	Pure Resin	Structural Steel	Aluminium
Tensile strength × 10^3 p.s.i.	120	25–50	20–30	6	100–200	10–35
Specific tensile strength × 1,000 lb./in.²/s.g.	63	15–30	12–22	5	12–16	4–14
Compressive strength × 1,000 lb./in.²	70	30–35	25	21	50–60	10–15
Cross-breaking strength × 1,000 p.s.i.	150	30–50	27–32	13	60–65	10–15
Young's Modulus in bend × 10^6 p.s.i.	6	2–3	1·2–1·7	0·3	30	10
Impact strength (unnotched) ft. lb./in.	70	25	20	0·3	45	20
Specific gravity	1·9	1·7–1·9	1·5–1·6	1·3	7·8	2·7
Moisture absorption (24 hours) %	0·15	0·2–0·5	0·4–1·0	0·4	—	—
Thermal conductivity B.T.U. in./ft.²/hr./°F.	3·0	2·0	1·7	1·2	300	1,400
Coefficient of linear expansion /° C.	7	10	25	100	12	23
Typical glass content (by weight) %	70	60	35	0	—	—

* F. W. Berk and Co. Ltd. † Consultant.

References

1. A.S.T.M. Spec. D.1201–52T.
2. *Mod. Plast.*, 1952, **29**, No. 9, 111.
3. *Anal. Chem.*, 1949, **21**, 1448.
4. *S.P.E. Jno.*, 1952, **8**, 8.
5. *Trans. P. I.*, 1954, **22**, No. 48, 125.

Section 16. Textiles and Fibres.

A RANGE of American instruments for textile testing is described (1). The surface abrasion tester comprises an inflatable rubber diaphragm, over which the specimen is mounted with electric contact points, one in the abradant surface and the other in the diaphragm. Wet or dry abrasion testing may be conducted on the same machine.

The Celanese Wrinkle Tester and the C.S.I. Pilling Tester are described, together with instruments for measuring cloth thickness.

" Methods of Test for Textiles " issued by the British Standards Institution (2) is an invaluable source of information on the testing of textiles. Tables are given for a scheme of identification of various natural and synthetic fibres.

An examination is made (3) of three methods of determining the water vapour permeability of Saran film:—

1. Standard Cup Test—a constant pressure evaluation.
2. Variable pressure technique on a Modified General Foods gas pressure cell.
3. High vacuum variable pressure technique.

Elastic Recoveries (4)

(Recovery from 20% stretch)

	%		%
Nylon 60	77	Rayon	30
Dacron polyester	36	Acetate	20
Orlon acrylic	41	Silk	35

Tensile Strength (Instron Machine)—Dry Fibres

	Megagrams/cm.²	*Strain* %
Dacron	5.0	55
Nylon	4.5	58
Orlon	2.3	35
Dynel	3.5	38
Silk	5.8	27
Acetate	1.4	20
Viscose	2.5	13
Cotton	2.7	11

Inflammability	Ignites and burns with difficulty.
Low temperature flexibility ° C.	—50
Yield stress at break p.s.i.	14,000
Tensile strength p.s.i.	25,000
Elongation at break %	50
Tear resistance (Elmendorf) gm. cm./cm. tear/0.001 in. thick	120
Folding resistance	No damage after 100,000 cycles
Acids	Unaffected except Conc. H_2SO_4
Alkalis	Moderate resistance
Oxidizing agents	Good
Dielectric strength v./mil.	4,500
Volume resistivity ohm/cm.	1,017
Dielectric Constant 10^6 c/s	3.0–3.1
Power factor 10^6 c/s	0.013–0.015

Water-repellency test methods and apparatus are reviewed (5). Four methods are given:—

1. The Slowinski Spray method.
2. A modified Slowinski method.
3. The Karrholm Shower test.
4. The hydrostatic pressure method.

The essential properties of Terylene (polyethylene terephthalate) polyester fibre in fabric and cord form are discussed in relation to other materials (6). Terylene filament yarn, and consequently the fabric and corded structures made from it, shrink on exposure to elevated temperatures, and it is necessary to stabilize it by a process known as " heat setting," which is discussed.

Test samples can be produced either completely amorphous by quenching from the melt (7), or relatively highly crystalline by slow cooling from the melt. The amorphous type crystallizes when the temperature is raised above 80° C.

The dielectric constant and loss tangent were determined (8) as a function of frequency 10^3 to 10^7 c./sec., and at a temperature of —80° C. to × 180° C. The volume resistivity in the higher temperature range was also studied.

Glass-fibre forms and properties are given (10).

Properties (9) Terylene Film

S.g.	1.39
Area factor in ²/lb./0.001 in.	20,000
Water absorption % (prolonged)	0.5
Water permeability 38° C. 90% R.H. gm./m.²/wr. hrs./0.001%	30
Melting point ° C.	265

PHYSICAL PROPERTIES OF EXPANDED MATERIALS

	Density lb./ft.³	Thermal Conduct B.T.U.	Maximum Working Temperature ° C.	Compressive Strength p.s.i.	Impact Strength ft./lb.
Cellulose acetate	4–8	0·30	150	75–175	0·04–0·15
Polystyrene	1·5–2·0	0·25–7	80	20–40	1·5
Phenol-formaldehyde	2–5	0·24	150	10–30	0·005–0·01
G.R.S.	4–5	0·23	60	50–80	3·0
P.V.C.	10–20	—	65	—	—
P.V. Formal	6–30	0·24	70	170	2·46–3·70
Ebonite	4–30	0·19	150	60	0·10
Thermazote	7–30	0·28	250–300	100	—
Plastazote	6–30	0·24	70–80	170	—

FIBRES—COMPARATIVE PROPERTIES

	s.g.	Moisture regain % 65% RH	Tensile Strength Kg./mm.² Dry	Tensile Strength Kg./mm.² Wet	E.B. % Dry	E.B. % Wet
Natural—						
Wool	1·31	16	16	86	50	45
Cotton	1·53	8	75	120	5	—
Silk	1·25	10	43	85	22	—
Glass	2·54	0	110	97	3	3
Synthetic—						
Rayon viscose	1·53	14	38	62	18	27
Vinyl chloride	1·35	0	27	100	16	16
Vinylidene chloride	1·72	0	74	100	25	25
Casein	1·29	—	9	43	50	100
Nylon	1·14	4	66	87	14	21

References

1. *Textile Weekly*, 1954, **53**, 384 (*Rubber Abs.*, 1954, **32**, 1156).
2. B.S. Handbook No. 11, 1949.
3. *Anal. Chem.*, 1950, **22**, 1541.
4. *Ind. Eng.*, 1952, **44**, 2105.
5. *Fibres*, 1953, **14**, 193.
6. Third Rub. Tech. Conf., 1954, Preprint, No. 34.
7. *Chem. & Ind.*, 8th Dec., 1951.
8. *Trans. Fara. Soc.*, 1950, **46**, 459.
9. *Plastics* (Lond.), 1953, **18**, No. 186, 17.
10. Glass Reinforced Plastics—Iliffe & Sons, London, 1954.

Section 17. Expanded Plastics.

A REVIEW of cellular products, including a note on properties that require investigation is given (1).

Various types of cellular plastics were exposed in the tropics, under varying conditions (2). Changes in weight, mould and insect attack, etc., were noted.

Phenolic foams, with or without skins, when subjected to vibration of specified amplitude and frequency, and given freedom to move inside a closed container, will lose volume, shake down, and powder (3). Those which exhibit post-cure shrinkage are more susceptible to volume loss, etc.

A paper (4) dealing with the testing of foamed natural rubber latex sponge should be consulted by those interested in other types of foam.

Tensile tests were made with a cylinder 1 in. dia. by 1 in. high, the ends being cemented to plates which had hooks for attaching to the tensile testing machine. Fatigue tests are also described, and it is noted that fatigue failure was not produced in any flexing cycle which does not include tension.

Properties (1)

References

1. *Plastics* (Lond.), 1953, **18**, 274.
2. M. of S. Rept. on Plastics in the Tropics, H.M.S.O., 1953.
3. *A.S.T.M. Bull.*, 1953, No. 189, 44.
4. *I.R.W.*, 1949, **121**, 179.

Book Review

Polyethylene

By R. A. V. Raff and J. B. Allison. 551 *pp. Published by Interscience Publishers Ltd., London. Price* $16.

Volume II in the High Polymers Series, and published under the general editorship of H. Mark, C. S. Marvel, H. W. Melville and G. S. Whitby, this work on polythene is in keeping with its predecessors. It is complete, it is up-to-date, and it carries 1,152 literature references. The present reviewer attaches great importance to this last item, for the hallmark of the authoritative book is the manner in which the authors have reviewed the published literature, and equally the accuracy with which they direct the reader to it.

Reviewing a work of this kind is difficult in that one can easily fall into the sin of all-embracing praise, or equally, disclose a string of minor errors the better to impress the reader. In fact, it would be difficult to imagine in what better manner Mr. Raff and Mr. Allison could have dealt with their subject. They have even managed the difficult task of keeping the essentially British contribution to polythene in perspective, and we are not allowed to forget the original and sustained impetus giving to the material's development by scientists in the United Kingdom. A photocopy, covering eight pages, is given of the pioneer British Patent 471,590, accepted on September 6, 1937. Coronation year, and how many heads in London were thinking about polythene? At the time that the patent was taken out, by Fawcett, Gibson, Perrin, Paton and Williams, very high pressures were being employed, in the order of 2,000 atmospheres, and the patent refers to temperatures of 170° C. The polymerized ethylene thus obtained was described as "a coalesced rubber-like white solid or a white powder."

From a discussion of the historical development of polythene, the book proceeds to deal with the chemical and physical properties of ethylene manufacture and purification. There follows a study of the polymerization of ethylene which is very complete. The chapter on modified polythenes is also of great value, and a considerable quantity of space is devoted to irradiation. Three photographs are included here, showing the effect of irradiation on polythene, originally published in *Plastics* in the issue for 1953, pages 143 and 144.

The chapter on molecular structure brings together a vast amount of scattered information, a most valuable section of the book. This will be much referred to in that it throws so much light on the behaviour of the polymer under various fabrication techniques.

Equally, the lengthy section devoted to properties, 136 pages, will be read with great interest because of the fund of information given. The only fault to find here is the somewhat scant information on environmental cracking or crazing. The authors conclude, and quote a table from *Industrial and Engineering Chemistry* (119, 43, 1951), that such cracking is greatly reduced by increasing molecular weight. Since we do not yet seem to be in sight of all the answers on this question, a somewhat lengthier discussion by the authors would have been welcomed, if only to record some of the failures.

This much must be said, however: the user of polythene, be he moulder, bag-maker or welder, will find in the chapters on properties the most complete case-history on the material yet published.

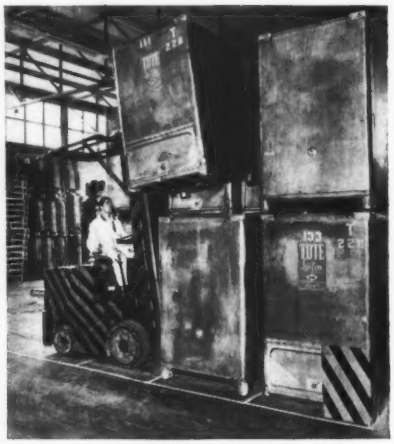
Developments in Mechanical Handling

READERS of *Plastics* will remember the special "Automation" issue published in September, 1956, in which a full description was given of the application in the U.S.A. of the Tote Bulk Materials Handling System. Last month a press visit was arranged to the factory of Winthrop Laboratories Ltd., Newcastle-on-Tyne, to see one of the first major installations of the Tote System in Great Britain, by Pressoturn Ltd.,* English licencees for the American process.

The principal of the Tote System is the use, with certain ancillary equipment, of aluminium bins of three capacities, 42, 74 and 110 cubic feet. At the top of each bin is a filling aperture 9 in. in diameter, and on the bottom is a discharge door 34 in. wide by 14¾ in. deep. The bins, as will be seen from the illustrations here, are robustly designed, with four short legs to give clearance to fork lift trucks and also to permit stacking.

The system has been designed to provide an economical means of bulk material handling and storage, to ensure complete product protection, to limit product loss, to limit the expense of providing and constantly replacing expandable containers, and to enable storage space to be used to maximum capacity.

There is the further advantage that the Tote System enables effective discounts to be obtained by virtue of bulk delivery, permits the use of general purpose flat-bed vehicles and enables bins to be moved around the factory site at will, to bring the contents to the actual point of use.



The use of Fork-lift trucks permits easy handling and stacking.

Finally, Pressoturn Ltd. have made arrangements for complete Tote installations to be provided under a hiring system, to bring the scheme within the range of all manufacturers.

At Winthrop Laboratories regular deliveries are taken of granulated sugar, bought from a refinery at Poppleton, in Yorkshire. On each delivery, 15 tons of sugar are loaded on a vehicle of 16 tons capacity. The average time taken to unload the vehicle is 14 minutes, a fraction only of the time that would be required for the same delivery in the form of bagged sugar. From the unloading bay, the bins are trucked as required through the plant to the various points of usage, being fed into the plant by means of the Tote Tilt unit. This latter is fitted with a screw conveyor, ensuring delivery of sugar into the plant system at the required rate of flow.

Apart from the flexibility of this relative inexpensive system of bulk handling, there is the great advantage that the sugar arrives in precisely the same condition as it left the refinery. No contamination has occurred and it has been completely protected from moisture thus ensuring that no aggregation has occurred. The carrying vehicle is also free to work on other duties and the necessity for the use of an expensive tanker or special-purpose vehicle is avoided.

The System is now being employed for the bulk handling of many other materials, including flour, plastics, carbon black, fine chemicals, cement, coffee and explosives. To the road haulier and to industry in general, the Tote System may well constitute the modern method of moving materials efficiently.

* Bulk Materials Handling Division, Pressoturn Ltd., Leam Terrace, Leamington Spa, Warwickshire.

Freeze Grinding of Plastics

WHEN cooled to very low temperature by liquid nitrogen (boiling point, = 195.8° C.), many substances acquire unusual properties. Rubber becomes hard enough to be machined. Zinc becomes brittle; so, to some extent, does carbon steel and iron; but aluminium, copper, brass and stainless steel are not affected by extreme cold.

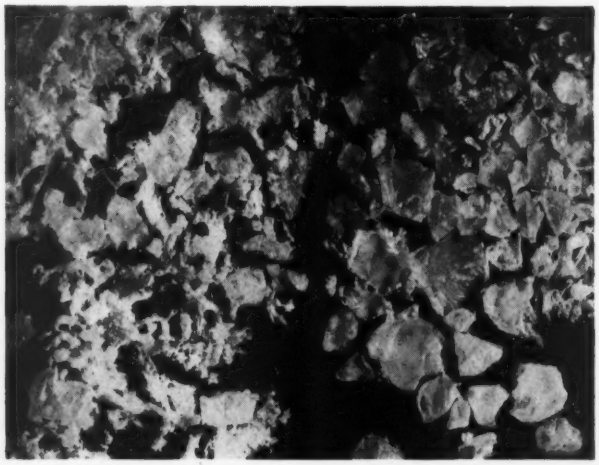
Based on these characteristics, a new technique, known as Freeze Grinding, has been developed. This, it is claimed, can reduce costs, raise production rates, avoid degradation of the product, result in finer particles and reduce explosion risks. In addition, some materials hitherto unsuitable for reduction to fine particles can now be ground.

Freeze grinding is particularly suited to materials which are volatile or sensitive to heat or oxidation, including many foodstuffs containing oils; to pharmaceuticals easily affected by heat or oxidation; and to plastics like polyvinyl chloride where normal methods are slow and tend to produce particles rather ragged in appearance.

Field trials in Britain, initiated by British Oxygen Research and Development Ltd., have used stainless steel high-speed hammer type mills fed by cooled particles from a heat exchanger to which the liquid nitrogen is fed from a small transporter by dry nitrogen gas cylinders.

Most of the experimental work was carried out on polythene and nylon which are not easily powdered without generating enough heat to cause molecular degradation. The most promising results were obtained with nylon. Ignoring capital outlay, a cost analysis indicated that nylon could be processed for an increase of 12% on the raw material cost. It was demonstrated that, if ground at ambient temperature, the throughput of nylon is less than one-eighth of that of the low-temperature process. Hence, although the prime cost is lower with normal methods, the burden of on-costs should favour the use of freeze grinding.

While freeze grinding is not expected generally to reduce costs among the more friable materials, new products and processes, dependent on small particle size, may be expected to be developed in many industries. For it is now possible for the first time to obtain many materials in finely divided form.



Photomicrograph showing, on the left-hand side, polythene crystals ground at normal temperature, and on the right-hand side, polythene crystals ground with liquid nitrogen.

Patent Review

The following abstracts have been made from specifications at the Patent Office, with the permission of the controller of H.M. Stationery Office. The country of origin for Convention Applications is shown in parentheses. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 3s. 6d. each (including postage).

B.P. 768,562. Foamed plastics. To: Spumalit-Anstalt (Switzerland).

Refers to the production of foamy urea-formaldehyde resin of fine structure in a continuous process in three phases. A foam-forming liquid is converted into a coarse foam by pneumatic means. Then the coarse foam is converted by mechanical means into a foam of fine structure. In the third phase a urea formaldehyde resin is admixed with the fine foam. The product has excellent heat insulating properties, is non-inflammable, rot-proof, inodorous, non-poisonous.

B.P. 768,565. Method of and apparatus for treating paper to which a coating of thermoplastic material has been applied. To: Charlestown Paper Co., Ltd. Comm. from: Kalamazoo Vegetable Parchment Co.

B.P. 768,571. Semi-moistureproof sheet wrapping material. E. G. Sanderson, G. I. Evans. To: British Cellophane Ltd.

For packing fresh produce and processed meats. Polysiloxane resins are used in the surface coating.

B.P. 768,575. Paint roller. L. Engels.

With a cylindrical body of foamed (e.g. polyurethane) plastic mounted on a metal tube.

B.P. 768,666–70. Production of polymeric materials. R. Roberts. To: Monsanto Chemicals Ltd.

Polymerization of ethylene by exposing it to the action of Υ-rays emitted by radioactive substances.

B.P. 768,689. Transfusion appliance for intravenous injection. A. Vintrand, C. Szmukler (France).

A drop-by-drop appliance comprising a sleeve closed by two plugs with inlet and outlet tubes. Sleeve and plugs are made of polyvinyl chloride or other synthetic elastomer.

B.P. 768,699. Production of resin bonded glass-cloth laminates. J. W. Haworth. To: British Oxygen Co., Ltd.

Glass cloth is impregnated with an alkylated melamine-formaldehyde resin soluble in aromatic hydrocarbons. Such laminates are much more resistant to cold water than those made with an aqueous melamine condensate.

B.P. 768,762. Manufacture of solid sulphonated synthetic resin tanning agents in a compact form. To: Farbwerke Hoechst A.G. vormals Meister Lucius & Brüning (Germany).

B.P. 768,804. Bottle closure. W. Satz. To: M. L. Gold.

A closure for bottles holding carbonated beverages after removal of the swedged cap, consisting of a plastic shell with a sealing device slidable within the shell and having spring jaws and including a rubber gasket.

B.P. 768,808. Vinyl aromatic resin compositions stable to light. To: Dow Chemical Co. (U.S.A.).

B.P. 768,812. Multiple superimposed tray assemblages. G. H. E. Conradi.

Moulded integrally with each tray a shallow spacing member to engage the tray beneath and/or the tray above.

B.P. 768,815. Licence holder for motor vehicle. V. Marinof (Belgium).

The licence is enclosed in a flat plastic two-part case one part of which is transparent. A rubber sucker is attached to lateral projections.

B.P. 768,841. Manufacture of glass fibre mat. W. H. Wise. To: Bigelow-Sanford Carpet Co. Inc.

A product for use as reinforcement of moulded plastic articles made of chopped-up glass fibrous multi-filament strands mechanically interlocked by the glass strands themselves.

B.P. 768,844. Pigmented organic plastics and method for preparing the same. To: B. P. Goodrich Co. (U.S.A.).

A solid pigment and a solid organic plastic are milled with an intimate admixture of water, a liquid organic water miscible solvent for the plastic and a minor portion of a liquid organic water-immiscible solvent for the plastic.

B.P. 768,887. Production of resinous materials. To: Ford Motor Co., Ltd. Comm. from: Ford Motor Co.

Reactive mixtures of liquid furane derivatives and maleic acid or anhydride of maleic acid or both. For rapidly producing resin-bonded sand shells or moulds.

B.P. 768,899. Manufacture of porous articles from polymeric resins. To: Badische Anilin- & Soda-Fabrik A.G. (Germany).

A finely divided polymeric resin containing a volatile solvent obtained by incomplete evaporation of the solvent from a resin-solvent solution is used for expansion in a non gas-tight mould. The mould is filled with such an amount of the resin that the expanded particles exercise an excess pressure on the inner surface of the mould.

B.P. 768,960. Decorative thermosetting resin laminates. To: H. Römmler G.m.b.H. (Germany).

A table top having a high-gloss surface is provided with a network of fine smooth-edged ribs (0.1 to 0.3 mm. above the surface) as protection.

B.P. 768,961. Thermosetting organopolysiloxane moulding composition. To: Standard Telephones and Cables Ltd. (U.S.A.).

Octoates (metal salts of 2-ethylhexoic acid) as catalysts to enable curing in a much shorter time and at lower temperature than uncatalyzed resins.

B.P. 769,054. Bottle or like closures. To: Bunder-Glas G.m.b.H. (Germany).

Two-part plastic stoppers. A resilient finger is inserted and projects from the hollow stopper so as to bear on the tablets, etc.

B.P. 769,058. Flexible bag. A. D. Hoeppner. To: Bemis Bro. Bag Co.

The closure flap is rearwardly folded into open position to facilitate separating a bag from a stack of bags and also the filling of the bag. The bag may be of transparent plastics for certain purposes.

B.P. 769,072. Floating holder for blankets. J. F. Turner, R. E. Turner.

A moulded ring with a narrow slit and with a slotted tab and a lip for a safety pin.

B.P. 769,091. Production of condensation products, resinous foams and polymeric materials of high molecular weight. To: Monsanto Chemical Co. (U.S.A.).

Refers to polyurethanes containing a plurality of isocyanate or isothiocyanate groups.

B.P. 769,093. Process for bonding polymerized substances to other materials. S. F. Deakin. To: Edison Swan Electric Co., Ltd.

For bonding polytetrafluorethylene with rubber. Metal particles are embedded in the surface of the preformed plastic. The particles are then either dissolved out of the plastic to leave a pitted surface or they may be left to provide a roughened surface.

B.P. 769,104. Injection moulding. J. W. Hendry. To: Tube Turns Plastics Inc.

Refers to the pre-conditioning of a plastic mass prior to the moulding operation in large capacity moulding machines preventing overheating. Heating from an external source is limited to a point where the plastic mass is well below the danger point. It is then brought to a uniform temperature within the moulding range by the frictional heat developed by the intermittent mechanical working of a portion through the feed screw in a sufficiently short time and under sufficiently accurate control.

B.P. 769,132. Vinyl chloride polymers suitable for use in plastisols. To: United States Rubber Co. (U.S.A.).

Vinyl chloride polymer latex is spray dried in separate portions under different drying conditions and ground to a fine powder. Such powders mixed together and compounded with a plasticizer to form a plastisol result in a plastisol of decidedly lower viscosity than the average of plastisols obtained from any of the powders above.

B.P. 769,237. Siloxane resin foams. Midlands Silicones Ltd. (U.S.A.).

A powder mixture of a siloxane resin, a setting catalyst and a blowing agent is heated until the foamed resin is cured.

B.P. 769,259. Disc-like seal or gasket for closing bottles, flasks or like containers. R. Sachot. To: Rical.

Made of rather stiff material such as "Rilsan" or "Nylon." The edge is formed of two thin lips flexibly connected with the central disc portion in the bottle neck.

B.P. 769,326. Method of manufacturing rods of glass fibre reinforced plastic. H. J. J. Pancherz (Sweden).

Fishing rods are made from glass fibres unwound from a number of spools and passed separately into a container filled with an unsaturated polyester. The impregnated fibres are then drawn through a heated steel tube, which they leave as fibre bundles in hardened plastic to be cut into lengths.

B.P. 769,335. Packages for hypodermic needles. S. J. Everett, S. & R. J. Everett & Co., Ltd.

A plastic (polythene) block with grooves or bores for the needles. The needle mounts project over cheeks extending on either side of the block. A flexible (transparent) plastic cover is folded around the cheeks so as to enclose completely the needle mounts.

B.P. 769,342. Hypodermic injector devices. H. Grylls.

A one-piece polyethylene moulding with a neck portion fitting into a cup shaped metal member carrying the needle.

B.P. 769,344. Pigments comprising sulphonamide-melamine formaldehyde resins. To: Switzer Brothers Inc. (U.S.A.).

B.P. 769,415. Thermosetting aminoplast compositions. To: Rutgerswerke A.G. (Germany).

Use of dry powdered amino acids as latent

catalysts. It has been found that these have an accelerating effect on the hardening of resinous condensation products obtained from urea melamines and aldehydes.

B.P. 769,416. Applicator type container. R. L. Demuth.

For applying a cleaning fluid to textiles, a (glass or) plastics bottle integral with a domed top. A replaceable applicator pad is screwed over the top by a flanged metal ring to enable adaptation of the outer pad layer to the textile material to be treated.

B.P. 769,449. Head linings for vehicles. R. E. Bentley. To: Fisher & Ludlow Ltd.

Use of strips of supported polyvinyl chloride (coated textile base) the marginal portions of of which are heat bonded together to provide transverse pockets for the listing rods.

B.P. 769,451. Glass or other rigid panel units. E. D. Hinchliffe. To: Hills (West Bromwich) Ltd.

To impart sound and heat insulating properties. Two sheets are kept together in spaced relationship in a channel frame by strips of flexible and impervious material around the periphery of the unit projecting with a fold into the interior space between the sheets along the edges.

B.P. 769,480. Book rest for attachment to the person. M. Hegarty (Irish Republic).

For hospital patients or when travelling. Two moulded ("Perspex") halves hinged together to form a framework attached to the person by flexible straps.

B.P. 769,574. Signs. Pearce Signs Ltd., J. H. G. Pearce.

Channel or box shaped (in cross section) characters, e.g. moulded from coloured methylmethacrylate. A tubular lighting unit may be incorporated.

B.P. 769,606. Sport rackets. G. I. Emsley. To: Slazengers Ltd.

With a reinforced shaft of laminated construction (layers of resin-bonded glass fibres intermediate, and bonded to, wooden laminae).

B.P. 769,661. Vacuum flasks. J. E. Wilson. To: Thermos (1925) Ltd.

The inner glass vessel is supported within the outer casing by a one-piece polyethylene moulding of a disc with outwardly tapered upper and lower rims the lower rim being provided with outwardly projecting locating lugs.

B.P. 769,666. Foamosols and expanded plastics therefrom. To: Rohm & Haas Co. (U.S.A.).

A tert-alkyl ammonium nitrite is mixed with a plastisol and heated till decomposition of the nitrite occurs and the plastisol is fluxed. Tert-alkyl ammonium nitrides are particularly effective in forming foamed objects in closed moulds.

B.P. 769,680. Manufacture of porous or homogeneous polyurethanes. To: Farbenfabriken Bayer A.G. (Germany).

Castings for electrical engineering, fittings, low pressure mouldings, rigid, semi-rigid or elastic.

B.P. 769,681. Cellular foamed plastics and process of producing same. To: Farbenfabriken Bayer A.G. (Germany).

An organic polymer containing hydroxy and/or carboxylic acid groups is reacted with an isocyanate in the presence of water, a basic reaction accelerator and a non-basic metallic compound. The metallic compound is probably the cause for the outstanding properties of these plastics.

B.P. 769,682. Apparatus for use in the production of porous or homogeneous plastics. To: Farbenfabriken Bayer A.G. (Germany).

A chamber with means for injecting liquids under pressure. At least one of the means (nozzle) injects a component under substantially higher pressure than the pressure in the chamber. The discharge opening is so dimensioned that a super-atmospheric pressure can be maintained in the chamber.

B.P. 769,687. Glass fibre and plastic sheets and films, apparatus for and method of making same. To: American Machine & Foundry Co. (U.S.A.).

A suspension of fibres free from lumps is prepared in a viscous liquid and formed into a sheet, which can be very thin. The liquid is then removed and the sheet or web dried. As liquid may serve glycerine or an aqueous solution of a suitable cellulose derivative ether. Polytetrafluorethylene and silicone are mentioned as bonding agents.

B.P. 769,696. Protector of brassica crops and other plants. C. Tieney.

A cylinder of, e.g. transparent or translucent plastics with teeth (serrations) around its lower edge for embedding in the earth.

B.P. 769,737. Structural members made from the class of materials known as plastics. To: Russel Reinforced Plastics Corp. (U.S.A.).

The laminate is composed of two superimposed bonded flat layers of plastic material having a non-adherent area extending over the greater part of their width to form a thin pocket for a reinforcing member (plastic rod, tube, channel). This is introduced centrally stretching the unbonded portions of the layers on both sides.

B.P. 769,810. Dispensing containers for liquids. Y. Kaplan, H. M. Ross (U.S.A.).

A sauce or syrup container made from thin plastic material sealed on two sides and one end, the other end being sealed after filling. When part of the sealed portion is torn away a narrow passage opens and successive small amounts of the contents may be squeezed out.

B.P. 769,820. Thermoplastic resinous compositions. To: B. F. Goodrich Co. (U.S.A.).

A major proportion of a vinyl halide polymer and a minor proportion of an interpolymer of styrene and alkyl methacrylate. The compositions have excellent clarity, are free from internal strains, possess an improved rate of flow during moulding.

B.P. 769,843. Toy space rocket. G. Meidenbauer (Germany).

The housing is made in two halves from transparent plastics by injection moulding with space traveller figures rockingly mounted inside. It may be constructed like a toy water pistol.

B.P. 769,885. Hand sprays. F. Grohe (Friedrich Grohe Armaturenfabrik) (Germany).

For a domestic bath made from plastic material. The headpiece is provided with a metal insert for the jet plate.

B.P. 769,900. Closure for bottles, especially for opened bottles. F. Ott (Germany).

A polystyrene cap with an aperture in a central boss for the stem of a sealing disc to act as stopper in the bottle neck. The closure is meant to replace, e.g., a cork after the first opening of a bottle.

B.P. 769,927. Separator for liquids. To: Bowser Inc. (U.S.A.).

For removing water from a water in oil emulsion. The separator is in form of a hollow cartridge made from fibre glass bonded with a phenol formaldehyde resin whereby the fibre glass mat is compressed during curing.

B.P. 769,943. Mould core and process for the manufacture of footwear with moulded soles. To: Etablissements Hutchinson Co. Nationale du Caoutchouc (France).

Refers to a core inflatable by pressure fluid.

B.P. 769,946. Production of polyester resins. To: Rohm & Haas G.m.b.H. (Germany).

B.P. 769,958. Synthetic resin coating compositions. To: Rohm & Haas Co. (U.S.A.).

Certain condensation products of certain N, N^1-dialkylmelamines with formaldehyde and an alcohol (group n-butanol, s-butanol, n-propanol) can be reacted with oil-modified alkyds to produce a rapid-curing composition for a non-blocking, heat-resistant coating suitable for high gloss paper or cardboard.

B.P. 770,012. Moulded top pieces or the like for shoes and boots. E. G. Fussell, C. B. Champion.

With a metal reinforcement having two arcuate ribs.

B.P. 770,036. Method and apparatus for covering a container with filamentary material. H. W. Trevaskis, E. Martin. To: Dunlop Rubber Co. Ltd.

Refers to air pressure containers with an inner shell and a covering of resin coated glass fibre of high tensile strength.

B.P. 770,051. Polyisocyanate modified polyester or polyester amides. D. H. Coffey, T. J. Meyrick, J. T. Watts. To: I.C.I. Ltd.

B.P. 770,057. Composition of phenol-aldehyde resins and elastomers for moulding battery cases. To: Richardson Co. (U.S.A.).

For cases with much thinner walls than practicable hitherto.

B.P. 770,067. Thermoplastic compositions. W. Saul. To: Semtex Ltd.

Oil-gas tar in admixture with certain polyvinyl compounds for use as joint-filling material (for pipes, road expansion joints, floors, bridges).

B.P. 770,071. Tobacco smoke filters. H. L. Green, D. J. Thomas. To: National Research Development Corp.

Interlaced polystyrene or polythene fibres the bulk of which has a diameter of less than 10 microns and which are lightly bonded by heat.

B.P. 770,214. Pad for lingerie. G. W. Carr.

For shoulder straps. The material may be a soft resilient plastic (plasticized p.v.c.).

B.P. 770,237. Method of producing a cellular structure in vinyl ester resin. To: Elastomer Chemical Corp. (U.S.A.).

A free flowing mass of plasticized polyvinyl chloride is moved through a closed system where an inert gas is introduced and the whole subjected to a mechanical beating action. The material is discharged through a nozzle as an expanded, creamy foam.

B.P. 770,275. Construction of jugs. M. A. Hassid, E. Venis. To: British Vacuum Flask Co. Ltd., M. A. Hassid.

A double-walled container (inner and outer container) with pouring spout as an integral structure. A hollow lid is provided, also with an air space. The inside of the outer container may be silvered and parts may be transparent.

B.P. 770,289. Polyisocyanate modified polyester and polyesteramides. D. H. Coffey, P. C. Johnson, T. J. Meyrick, H. G. White. To: I.C.I. Ltd.

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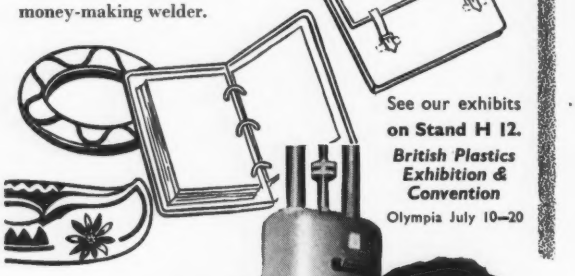

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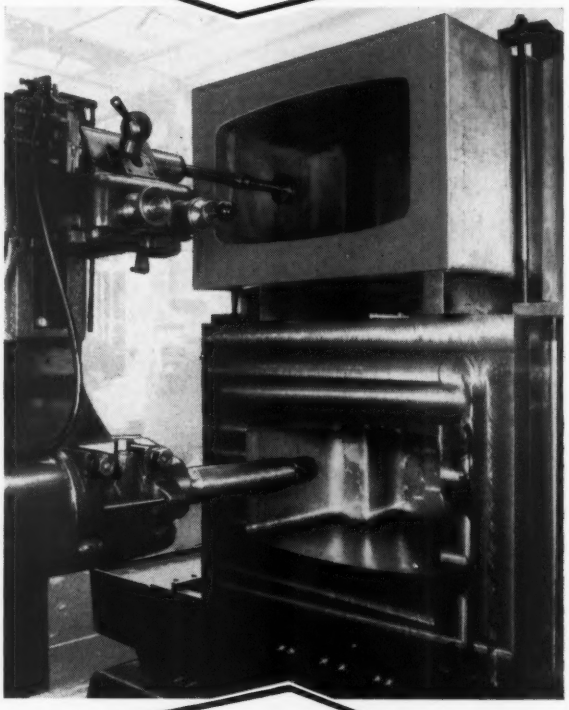

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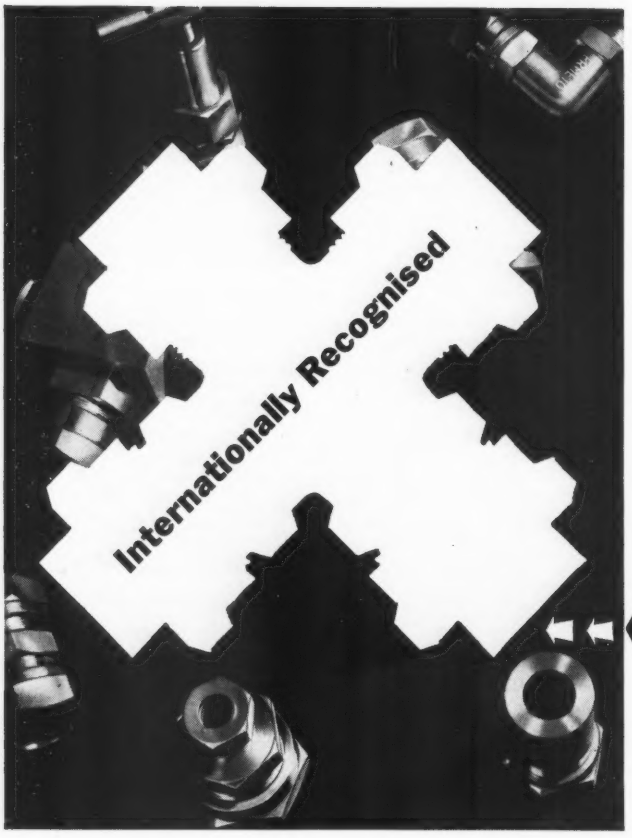

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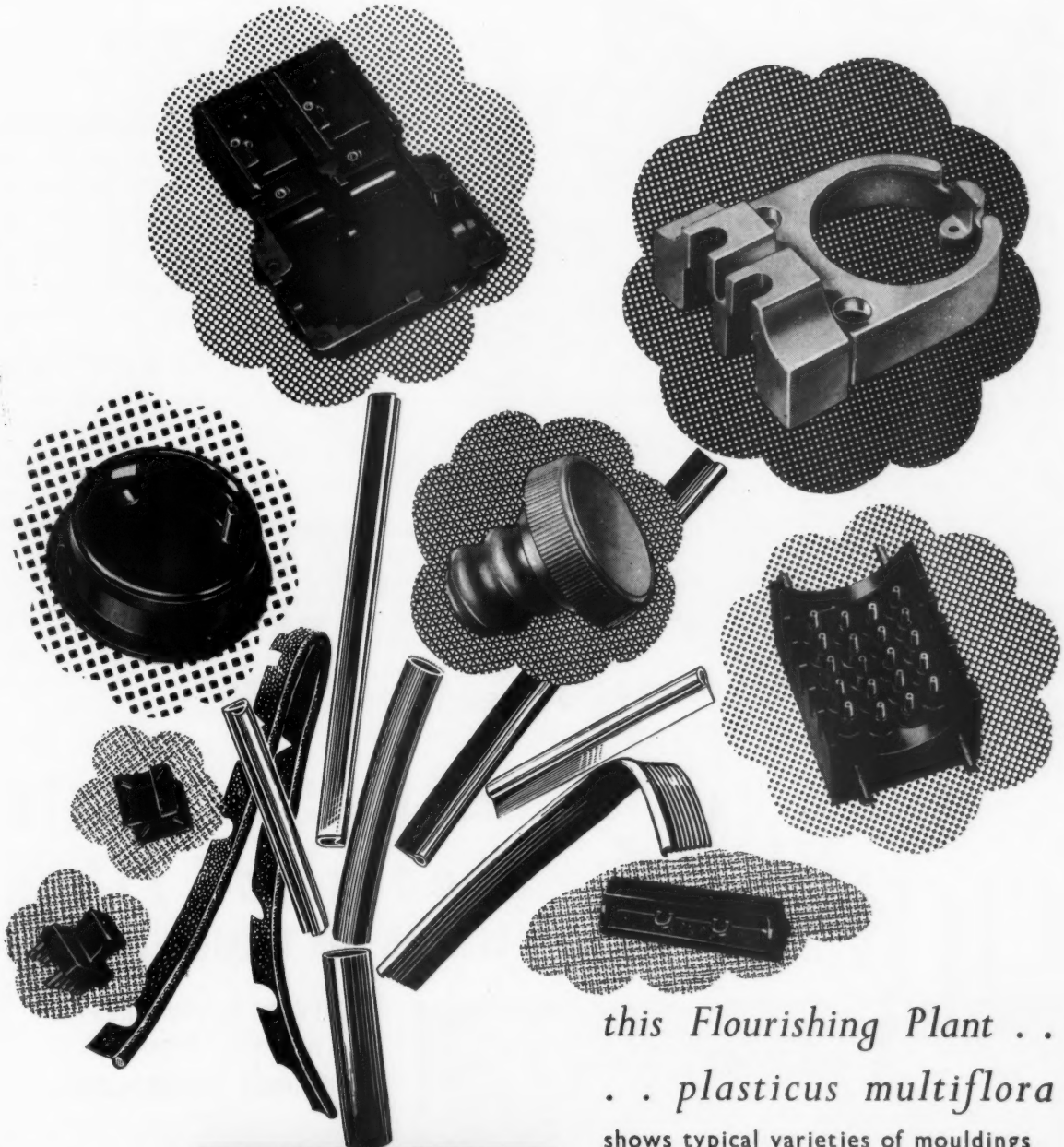

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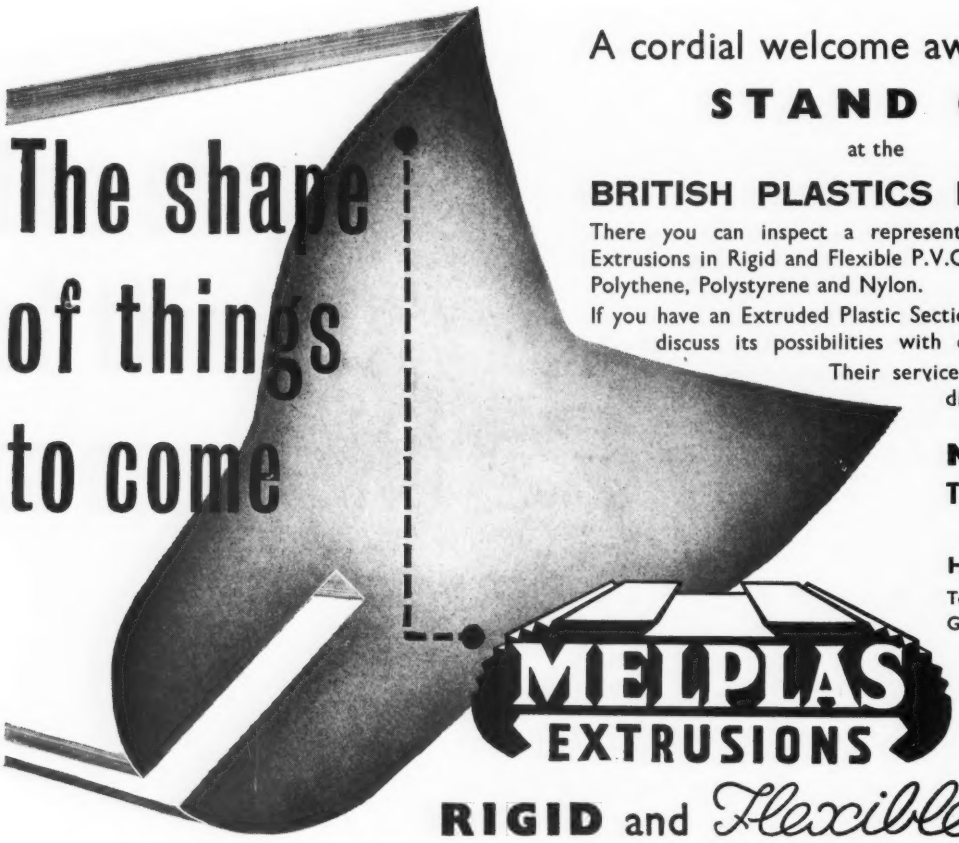

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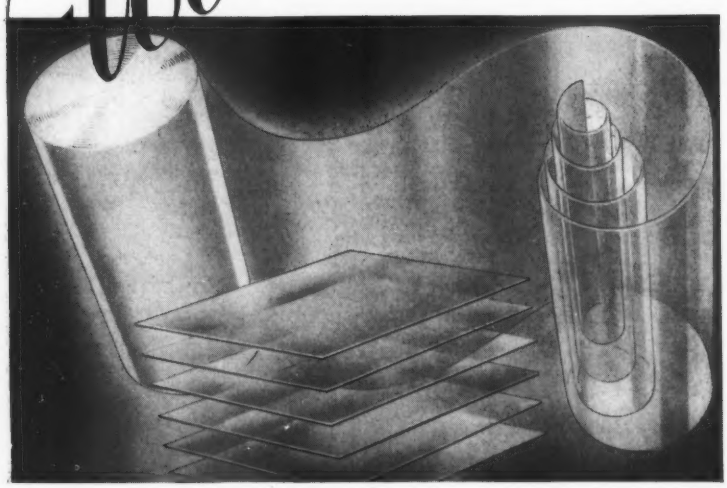

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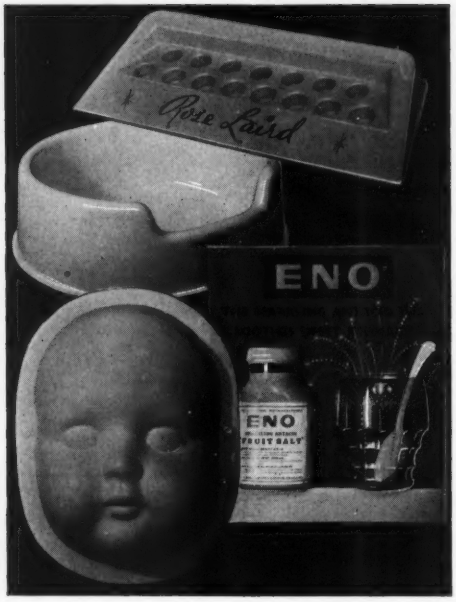

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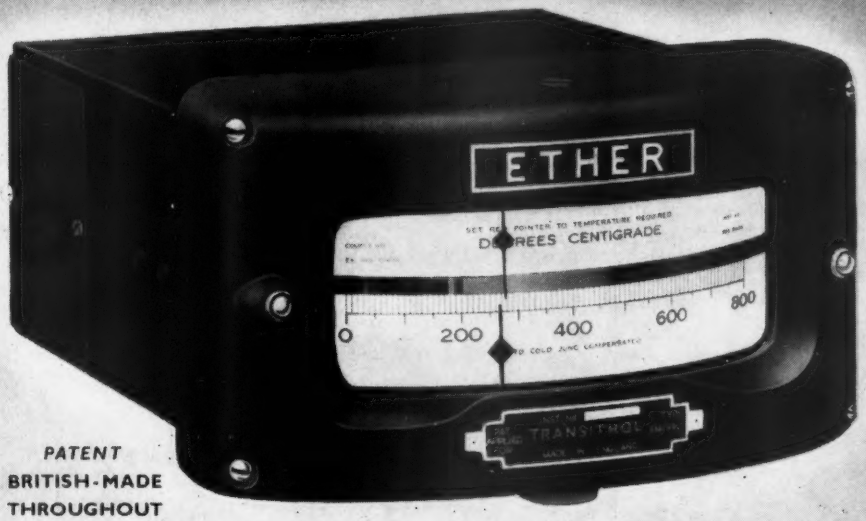

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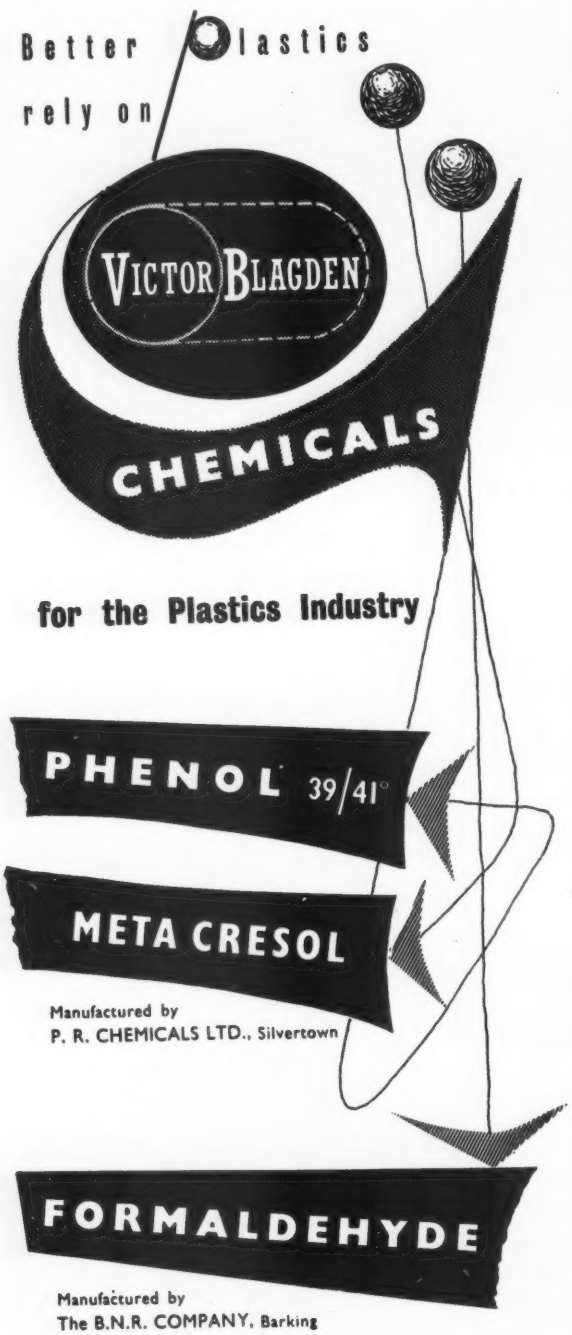

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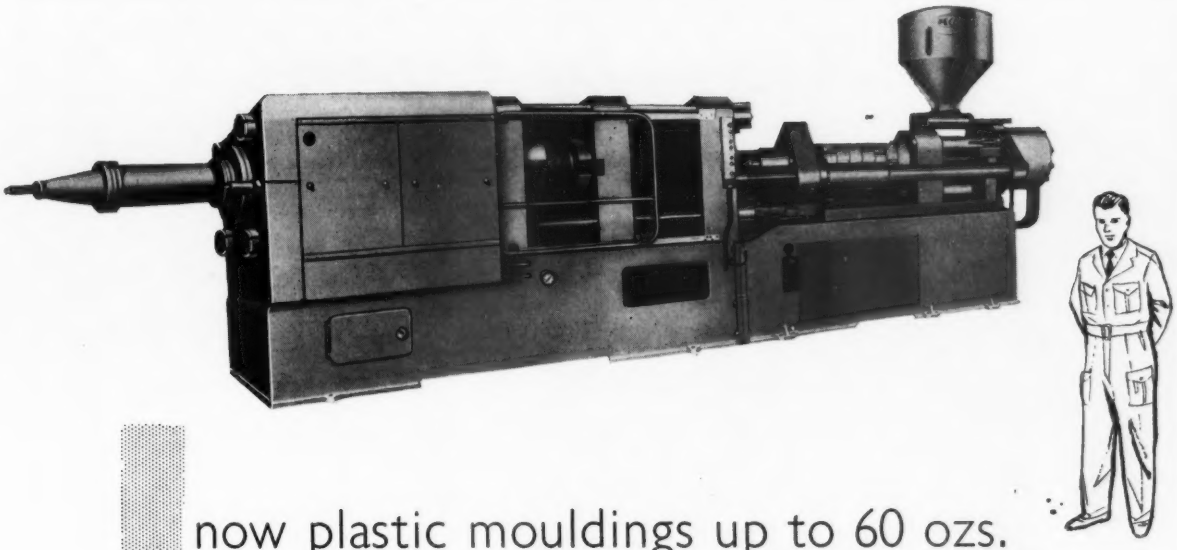

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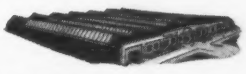

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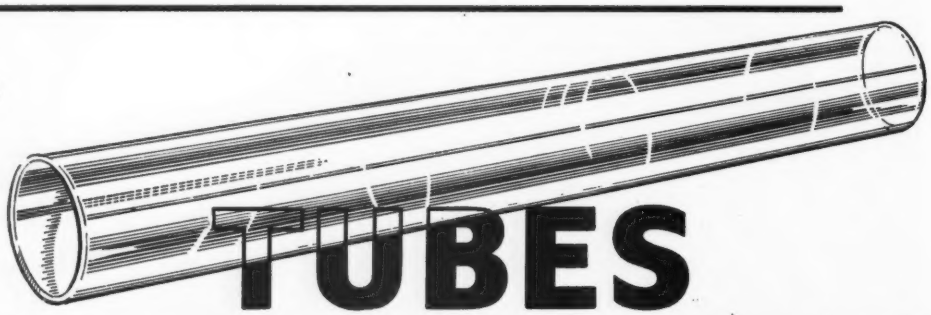

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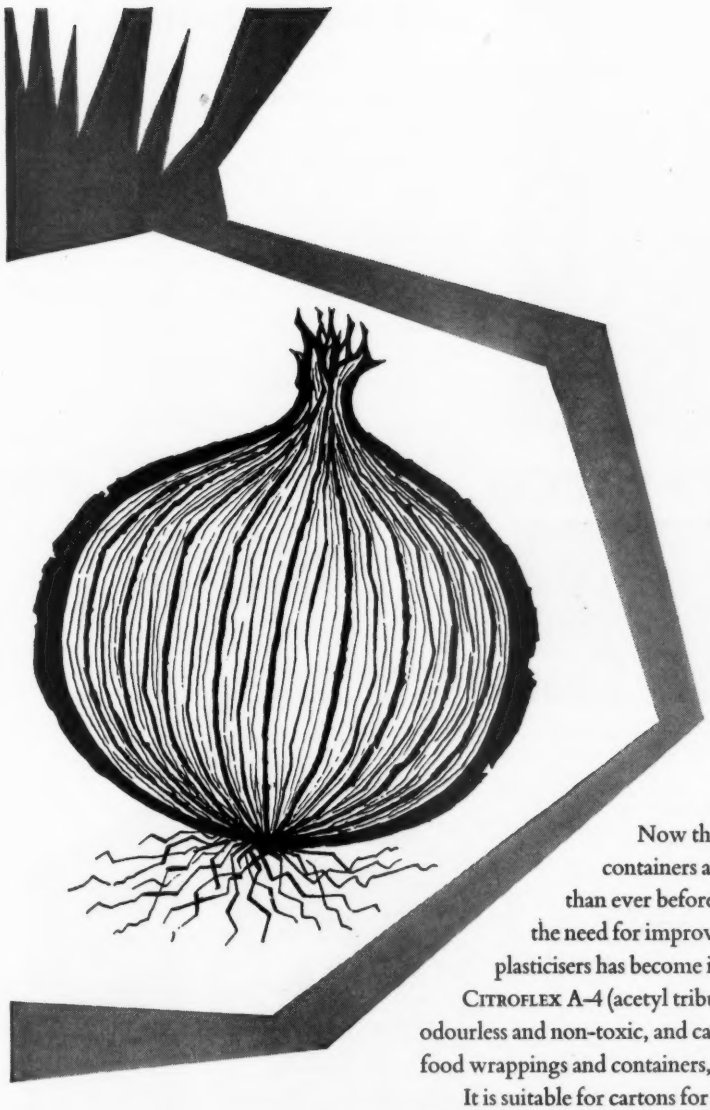

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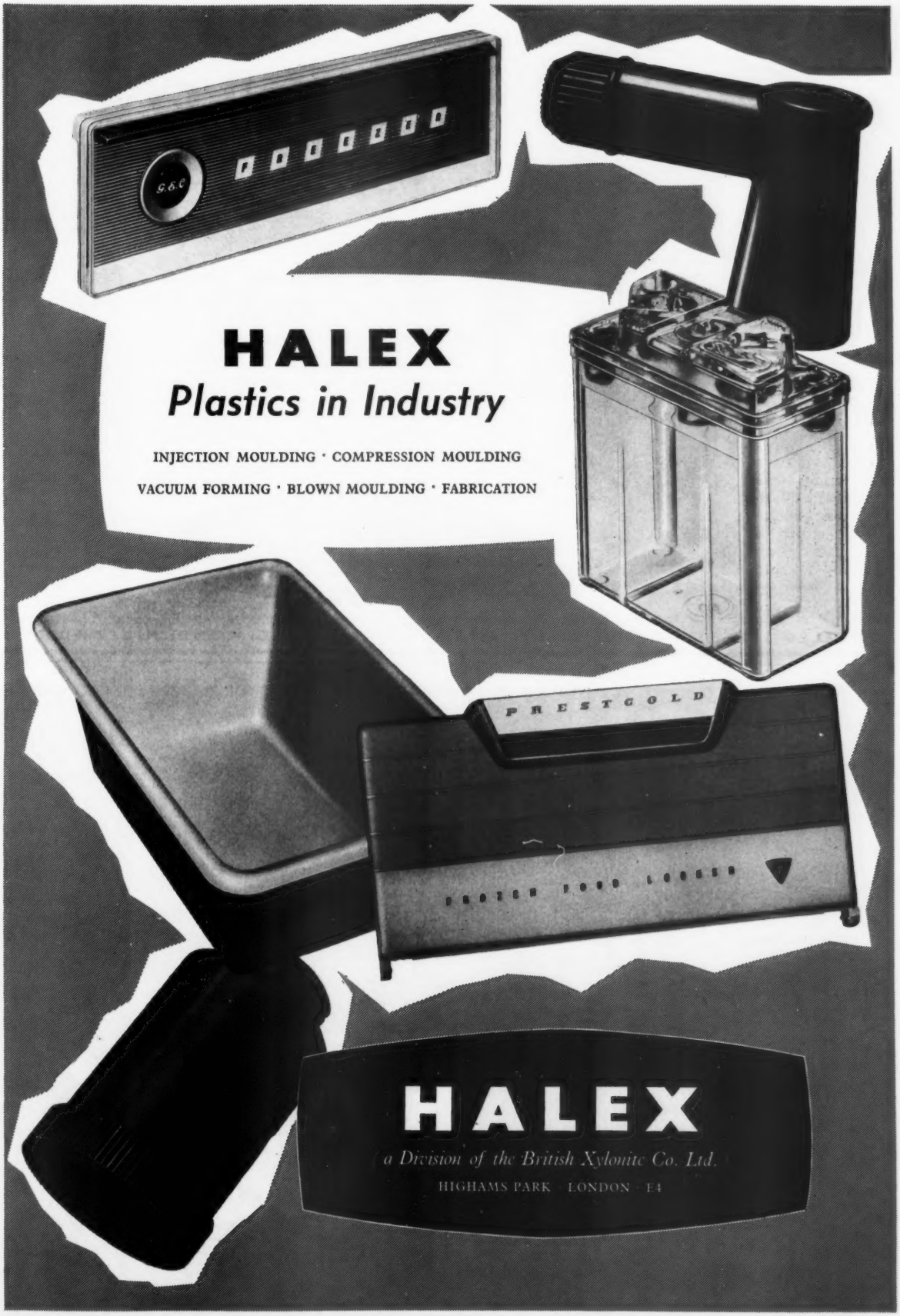
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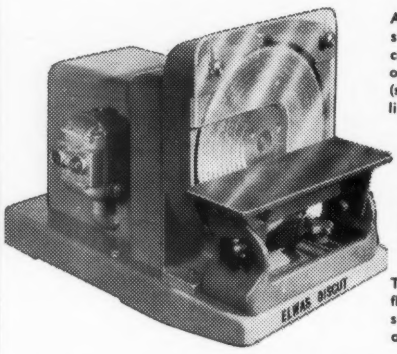

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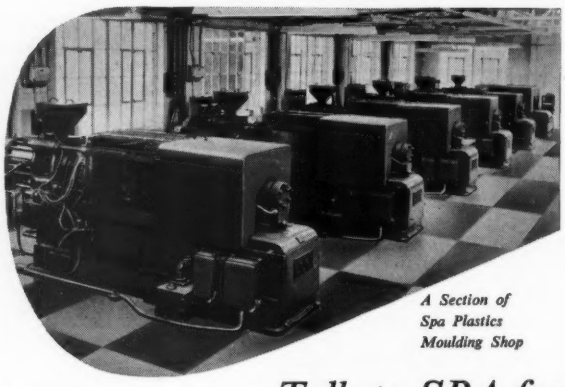

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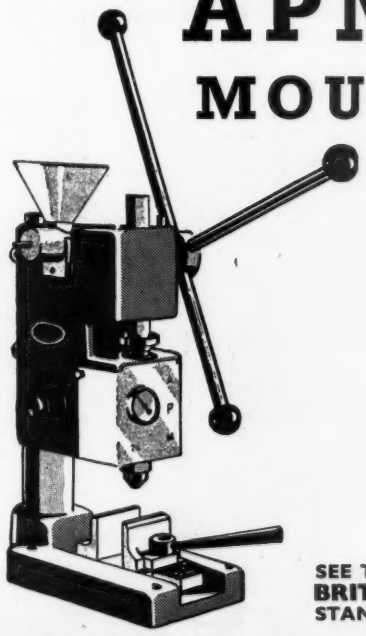

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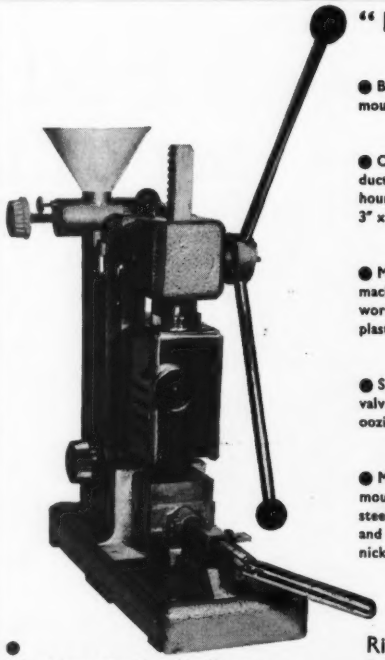

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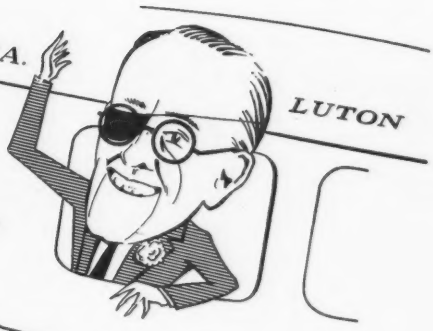

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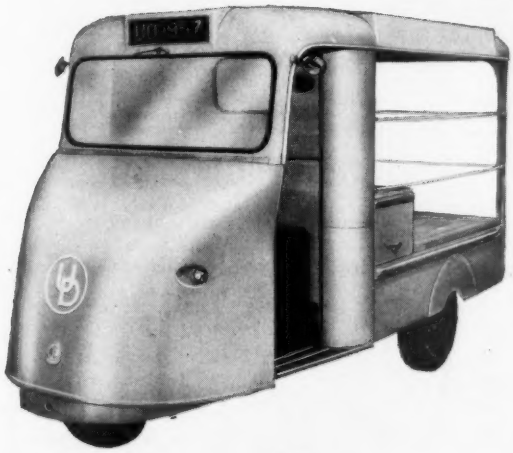

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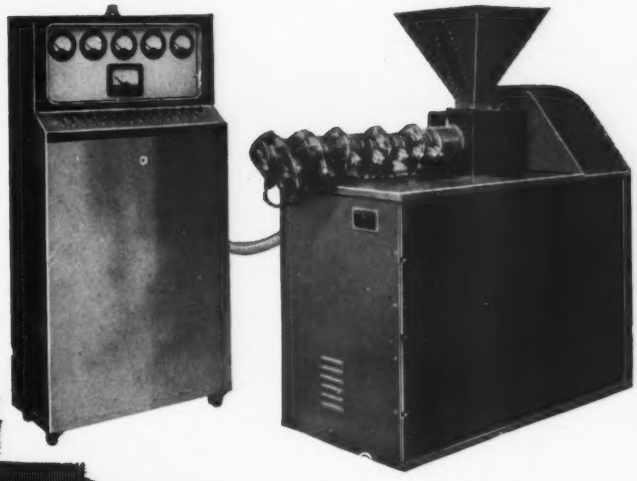

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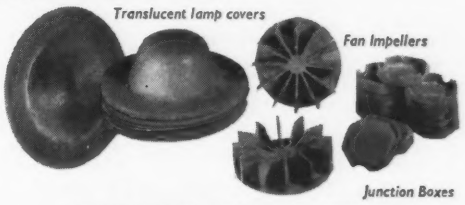

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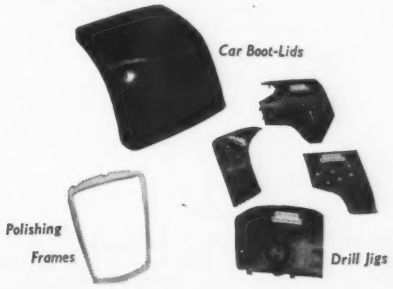

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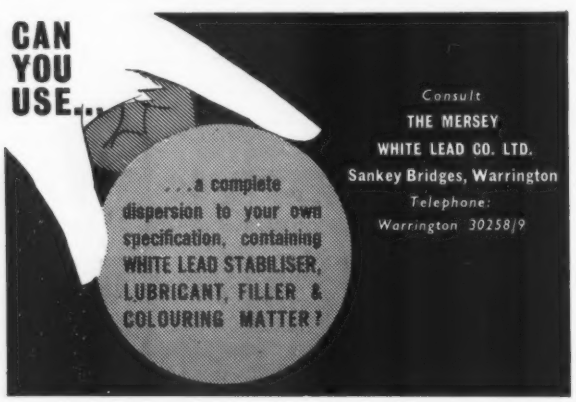

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PLASTIC MOULDINGS FOR THE TRADE

Plastics Classified Advertisements

PRESS DAY.—Classified advertisements for the July issue must be received at Head Office by first post Monday, June 24.

Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES.—6d. per word (minimum 12 words 6/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting 2 gns. per single column inch. Series discounts of 5% for 6, and 10% for 12 consecutive insertions allowed to trade advertisers.

TERMS.—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES.—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "Plastics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors although every care is taken to avoid mistakes.

BOX NUMBERS.—Private advertisers desiring to have replies sent care of "Plastics" may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. To avoid mistakes in forwarding, Box numbers should be carefully and legibly copied and replies sent to Box P000, care of "Plastics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM.—Facilities are available to readers to purchase advertised goods on approval by depositing the purchase price with "Plastics." Full details on application. Commission 1% (minimum 2/-) on amount deposited.

HEAD OFFICES.—Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, London Telex," Telex: 2-3039.

BRANCH OFFICES: 7, John Bright Street, Birmingham, 1. Telephone: Midland 4117-8. 50, Hertford Street, Coventry. Telephone: Coventry 62464. 1, Brazennose Street, Manchester. Telephone: Deansgate 6114-8. 12, Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

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239-5324

INQUIRIES INVITED from investors interested in establishment of p.v.c. processing factory to produce toys, automotive and domestic articles. South Coast. Box P3718, care of "Plastics." 237-XB6970

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THE INDUSTRIAL DESIGNER'S JOB is to help to improve the appearance and function of your products from the customer's viewpoint. His study of public taste and market trends, economical methods of production and assembly can save money and increase sales. W. Bruce Brown, M.S.I.A., F.R.S.A., 140 Roding Rd., Loughton, Essex. Phone Loughton 4138. 238-5389

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DESIGN AND DRAUGHTING SERVICES. We specialize in particular, in Moulds for Plastics, Compression, Transfer and Injection, also jigs and fixtures. We offer a reliable, speedy and confidential service. Spotona Ltd., Watchett Works, Oakhurst Rd., Southend-on-Sea, Essex. 222-115

PLASTICS MOULD DESIGN: Injection, Compression, Transfer. Competitive charges and deliveries. Product design and styling. Also Jigs, Tools, Fixtures, etc. D. & H. Designs Ltd., 265, Finchley Rd., London, N.W.3. HAMpstead 6656. zzz-136

MACHINERY, TOOLS AND PLANT

HYDRAULIC. Frazer mono-radial pumps, new and secondhand, in stock. Thompson & Son (Millwall), Ltd., Cuba Street, London, E.14. East 1844. zzz-119

DANIELS No. 3 Pelleting Machine for sale. Output 1,500 pellets per hour. Capacity up to 2⅞ in. diameter by 1½ in. thick. Fully motorized and in very good condition. Box P3619, care of "Plastics." 238-5386

VARIABLE SPEED drive set, Ward Leonard, 100 h.p., 1,000/0 r.p.m., complete with control panels, new, unused due to change of policy. Chiltern Hunt Ltd., Hemel Hempstead, Hertfordshire. 237-x6626

BRADLEY & TURTON Pelleting Press, Model No. P.4. Maximum pellet 2½ in. × ⅜ in. Thirty strokes per minute. Box P3618, care of "Plastics." 238-5385

MANESTY No. 2 Pelleting Machine for sale. Good condition. Fully motorized with built-in motors, 400–440/3/50. Maximum diameter of pellet 1½ in. Output 3,300 pellets. Box P3617, care of "Plastics." 238-5384

HYDRAULIC PRESSES

750-ton Downstroke Press by Shaw. Ram 31 in. dia. × 48 in. stroke. Four steel columns 8½ in. dia., shrouded by two cheeks acting as guides for moving table. Main ram fitted prefil valve. Moving table 4-ft. sq. Daylight 6 ft. Below press base are five double acting hydraulic cylinders with 24 in. stroke. Complete with Towler Electraulic Pump.

Five 1,160-ton Upstroke Presses by Rovertson and Orcher. Glanded ram 33½ in. dia. × 15 in. stroke. Four columns 8 in. dia., distance between 7 ft. 1 in. × 17 in. Semi-guided moving table and head with working area 6 ft. 5 in. × 4 ft. Daylight 13½ in. WP. 3,000 lb. sq. in. Fitted two C.I. Platens 6 ft. 5 in. × 4 ft. × 4½ in.

Two 550-ton Upstroke Presses by John Shaw. Ram 17⅞ in. dia. × 4 ft. 6 in. stroke. Four 7 in. dia. columns, distances 72½ in. × 20 in. Fully-guided moving table, working space 72 in. × 44 in. Daylight adjustable up to 78 in. WP. 2½ ton sq. in. Presses could be adapted as downstroking unit.

Three 400-ton Upstroke Presses by Greenwood and Batley. Glanded ram 16 in. dia. × 30 in. stroke. Four screwed columns 5½ in. dia., distances between 22 in. × 17½ in. Moving table, working area 3 ft. × 17 in. Daylight 42 in. WP. 2 ton sq. in.

375-ton Multi Daylight Press by John Shaw. Ram 15½ in. dia. × 5 ft. stroke. Four columns 5½ in. dia., distances between 72 in. × 20 in. Fitted 10 steam-heated Platens 72 in. × 50 in., giving nine daylights of approx. 3 in. WP. 2 ton sq. in.

350-ton Upstroke Press by Bradley and Turton. Ram 15½ in. dia. × 24 in. stroke. WP. 2 ton sq. in. Four steel columns 4½ in. dia., distances between 42½ in. × 15½ in. Fully-guided moving table, working area 39½ in. × 37 in. Daylight 33 in. Moving table returned by two pushback rams 4 in. dia. WP. 1,500 lb. sq. in.

80-ton Upstroke Press by Wild. Ram 12 in. dia. × 15 in. stroke. Four 3½ in. dia. columns, distances 17⅞ in. × 11⅞ in. Fully-guided moving table, working area 19 in. × 15½ in. Daylight 26½ in. Table returned by two 2½ in. dia. pushback rams. WP. 2,500 lb. sq. in.

80-ton Downstroke Press by Finney. Ram 10½ in. × 18 in. stroke. Four columns 3 in. dia., distance between 21 in. × 10 in. WP. 1 ton sq. in. Fixed and fully guided moving tables, working area 18 in. sq.

70-ton Upstroke Press by Oram. Ram 9 in. dia × 42 in. stroke. Four columns 3⅜ in. dia., distance between 5 ft. 10½ in. × 18 in. Semi-guided moving table 5 ft. 10½ in. × 44 in. Daylight approx. 6 ft. WP. 2,500 lb. sq. in.

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237-354

Machinery, Tools and Plant (contd.)

FOR SALE. One 350-ton Hydraulic Downstroke Press, suitable for plastic moulding. Apply: Ashdowns Ltd., Eccleston Works, St. Helens, Lancs. 237-36

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Phone, East 4081 (five lines). 237-46

COMPLETE for sale, silver reduction equipment for metallizing plastics, electric oven, pair of booths, air transformers, filters, hoses and fittings, solutions, and lacquers, guns, etc. Box P3722, care of "Plastics." 237-61

FOR SALE. Three HCSA4 Reavell compressors delivering 18 cu. ft. per min. at 900 p.s.i. and 720 r.p.m., complete with 12½ h.p. motors and all ancillary equipment. In excellent running order. Enquiries: Wall & Leigh (Thermoplastics) Ltd., Mill St., Darlaston, Wednesbury, Staffs. 237-49

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MACHINERY, TOOLS AND PLANT WANTED

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INJECTION MOULDING MACHINES required. Condition or size not important. Send details Box P3631, care of "Plastics." 241-5391

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3 OZ. INJECTION MACHINES REQUIRED for spot cash. Details to Box P3621, care of "Plastics." 237-x6495

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Eastfield side, Sutton-in-Ashfield, Notts. 237-51

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MOULDS required for Plastic Doyleys. Send full details to Box P3613, care of " Plastics." 237-56

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Phone, Croydon 8228 (two lines) zzz-133

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Raw Material (contd.)

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BUYERS OF ALL PLASTIC SCRAP.
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HIGHEST PRICES
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Please send samples and details to:
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POLYTHENE SCRAP—Herbert Connor Limited pay the highest prices for any form of polythene scrap, in lump, film, scrap, and ground form. Please send all details and samples to:—120 Beaufort Park, London, N.W.11. 237-30

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THERMO PLASTICS SCRAP. We always buy large and small quantities and pay prompt Cash. Send offers to J. W. Nash & Co. Ltd., 27 Beethoven St., W.10. Ladbroke 4655/6/7. 237-43

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SITUATIONS VACANT

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Situations Vacant (contd.)

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RESIN/GLASS DEVELOPMENT ENGINEER. Fibreglass Limited, manufacturers and processors of glass fibres situated in St. Helens, require a well qualified graduate mechanical or chemical engineer, preferably with experience in the plastics industry. The successful candidate will be required to take charge of a section of the Development Department, responsible for research and development on production techniques for Fibreglass reinforced plastics. The work will include full scale prototype moulding and technical service to customers, involving close collaboration with the Sales Department. Applicants, who should preferably be not more than 35 years of age, are invited to send details of their qualifications and experience to the Personnel Liaison Officer, Pilkington Brothers Limited, St. Helens, Lancashire (of whom Fibreglass Limited is a Subsidiary Company). 237-8

ENGINEERING DRAUGHTSMAN. A vacancy exists in the Research and Development Department of Fibreglass Limited, St. Helens, for a Draughtsman. The work will be primarily concerned with the design and development of plant for the manufacture of glass fibres. Experience in general engineering or process plant engineering is essential, and it is desirable that the successful applicant should be of a standard equivalent to the Higher National Certificate in Mechanical Engineering. Applicants, who should preferably be not more than 40 years of age, are invited to send details of their qualifications and experience to the Personnel Liaison Officer, Pilkington Brothers Limited, St. Helens, Lancashire, of whom Fibreglass Limited is a Subsidiary Company. 237-7

RESIN/GLASS DEVELOPMENT PHYSICIST OR MECHANICAL ENGINEER. Graduate physicists or mechanical engineers, who are interested in the field of Fibreglass reinforced plastics, are invited to apply for a vacancy in the Development Department of Fibreglass Limited, St. Helens. The work will be primarily on the testing of mechanical properties of materials, and it would be an advantage if the applicant were conversant with techniques and equipment for specialized tests, including creep and fatigue. Applicants, who should preferably be not more than 35 years of age, are invited to send details of their qualifications and experience to the Personnel Liaison Officer, Pilkington Brothers Limited, St. Helens, Lancashire, of whom Fibreglass Limited is a Subsidiary Company, quoting:—Ref. F. 237-6

TECHNICIAN required for Plastics Department of well-established manufacturing company situated in Mid-Herts. Applicants should have sound knowledge and practical experience of extrusion processes and ancillary equipment. An imaginative approach to development and production problems is also essential. The position is permanent and offers scope for speedy advancement. Apply to: The Secretary, Chiltern Hunt Ltd., Hemel Hempstead, Herts. 238-5415

LAYOUT ENGINEER. Ekco Plastics Ltd., Southend-on-Sea, require a Layout Engineer for their Method and Design Department. Duties embrace the layouts for spray painting, silk screen printing, annealing, rectification, packing and handling. Write stating age, qualifications, and experience to Personnel Manager. 237-10

DRAUGHTSMEN. Ekco Plastics Ltd., Southend-on-Sea, have vacancies in their Method and Design Department for special machine design draughtsmen. Electrical and mechanical experience essential. Write stating age, qualifications and experience, to Personnel Manager. 237-11

PLASTICS. Kangol Helmets Ltd. of Carlisle, Custom moulders in reinforced plastics, require assistant to Production Manager. Applicants must have had experience in the plastics field, preferably in reinforced plastics, and of supervision of labour. Applications giving full details of experience, qualifications and present emoluments to the above address. 237-14

Situations Vacant (contd.)

QUALIFIED CHEMIST (B.Sc., A.R.I.C.) required for progressive appointment for development work relative to the manufacture of P.V.C. film, extrusions, etc. Previous experience in this field not essential. Pension scheme. Applications giving details of age and qualifications to:—Chief Chemist, Greenwich Plastics Ltd., St. Mary Cray, Kent. 237-15

MOULD FITTER required for fitting and finishing quality moulds for all plastic materials. Applicants should have general toolroom experience and extensive experience on the manufacture of plastic moulds. Good rates of pay and prospects for men with initiative able to work without constant supervision. Applications to:—Personnel Officer, S. Smith & Sons (England) Ltd., Carlisle Rd., London, N.W.9. 237-16

PLASTICS—Industrial Group requires Manager, fully experienced technical, buying and selling, for their Reprocessed Division. Dohm Ltd., 167 Victoria St., S.W.1. 237-9

TOOLMAKER REQUIRED. Experience moulds essential. Permanent and high rate. Seaforth, 60 Oakhurst Rd., Southend, Essex. 242-5417

PLASTICS. INJECTION MOULDING MACHINE SETTER required by a company installing new equipment in a London factory. This is an excellent opportunity for a man experienced in this field and remuneration will be commensurate with ability. Write full particulars to Box P 882 LPE 55, St. Martin's Lane, London, W C.2. 237-5

PRODUCTION ENGINEER with initiative and drive, able to get the best out of labour, is required to assume eventual responsibility in medium-sized moulding shop in Midlands. A knowledge of injection moulding production technique an advantage. Quote fully past experiences in confidence. Good salary and pension scheme. Box P376, care of " Plastics." 237-21

EXTRUSION TECHNOLOGIST capable of managing complete extrusion plant, including die designing, research and development. Exceptional opportunities in young expanding organization in London area. Applicants must provide full details of qualifications, age and past experience. All applications will be treated in strict confidence. Box P375, care of " Plastics." 237-22

AN OPPORTUNITY exists with a leading foam plastic manufacturer for an experienced and enthusiastic representative to call upon industrial concerns from the Midlands to the South coast.

A CONNECTION with furniture and fancy goods manufacturers would be an advantage, although the material is used by most branches of industry.

APPLICANTS should write in the first instance giving full details of experience, connections, and present salary. Own car essential. Box P3714, care of " Plastics." 237-24

WORKS FOREMAN required to take charge of Extrusion Division of well-known company. Write giving details of experience and age to Box P3713, care of " Plastics." 237-25

WELL ESTABLISHED Chemical Factory on the outskirts of London require the services of an *expert* as Consultant, or for full-time position, in new department dealing with grinding, cubing and sheeting of scrap polythene. Housing could be provided. Early confidential application invited under Box P3712, care of " Plastics." 237-26

MAINTENANCE ENGINEER. Knowledge hydraulics and electricity. Permanent progressive position near London. Write Box P377, care of " Plastics." 237-32

QUALIFIED PLANNING ENGINEER to take full responsibility for Production Control of large and well-known Plastics Manufacturing Company in the London area, covering the whole field of plastics manufacture. Experience in the plastics industry of advantage. Duties include supervision of shop loading, estimating, methods engineers, progress chasers and customer liaison. Drive, initiative and administrative experience essential. High salary. Life assurance and pension scheme. Reply, giving details of experience and qualifications, to the Managing Director, Box P373, care of " Plastics." 237-35

CHIEF INSPECTOR required for company manufacturing plastic mouldings of all kinds—Compression, Injection, Extrusion, Rubber, Glassfibre. North London area. Must have previous experience in the plastics field and be able to control large staff. Pleasing personality and the ability to deal with customers and Ministry Inspectorate essential. Preference for A.I.D. approved. This is a senior appointment and only top rate men need apply. Superannuation scheme. Reply, giving details of qualifications and previous experience, to the Managing Director, Box P371, care of " Plastics." 237-33

FOREMAN, shaping and vacuum forming department, required. Modern house available. Application form from Tenaplas Ltd., Upper Basildon, near Pangbourne, Berks. 237-39

Situations Vacant (contd.)

SALES MANAGER wanted for well-known and established Plastics Manufacturing Company in the London area. This is a top level appointment and calls for a man of outstanding ability and drive with wide administrative experience and preferably with a plastics background. Permanent staff post. Life assurance and pension scheme. A high salary will be paid to the right man. Reply, giving full particulars, to the Managing Director, Box P372, care of " Plastics." 237-34

CHEMIST/PLASTICS TECHNOLOGIST. Young graduate of H.N.C. standard to join small research team engaged on evaluation of new resins and materials in moulding and laminating field. Five-day week, non-contributory pension scheme. Apply to Personnel Manager, Tufnol Ltd., Wellhead Lane, Perry Barr, Birmingham 22B. 237-1

SHELL CHEMICAL COMPANY LIMITED
requires for interesting work in a Technical Service Laboratory in the Manchester Area:

1. CHEMIST (Male)

preferably aged not more than 32 and holding a diploma or degree in Chemistry.

2. CHEMICAL ASSISTANT (Male)

aged not more than 32 and holding a suitable qualification in Chemistry (at least G.C.E. "A" level and preferably H.N.C.).

Experience in plastics (especially thermoplastics) would be an advantage in both posts.

Excellent prospects, generous pension scheme and other benefits. Salaries according to age, qualifications and experience.

Write with full details to
SHELL CHEMICAL COMPANY LIMITED,
Personnel Department,
170 PICCADILLY, LONDON, W.1.

237/57

PLASTIC EXTRUDER OPERATORS wanted, able to set up, start and adjust machines. Shift work. Write or telephone to Mange Plastics Ltd., 110–114 Cheston Road, Aston, Birmingham. East 2761. 237-41

OWING TO EXPANSION and reorganization of the sales force, full-time representatives with experience of extruded plastics are required for the following areas: Scotland, Lancs. and N.W. England, Yorks. and N.E. England, West Country. Terms: salary, commission and expenses. Full details to Tenaplas Ltd., Upper Basildon, near Pangbourne, Berks. 237-40

A VACANCY, due to promotion, exists for Junior Representative in London Area. Position is permanent and pensionable. Some experience in Plastics or Packaging would be of advantage. Replies marked confidential Cascelloid, 9 Conduit St., W.1. 237-55

PLASTIC PRODUCTION CHEMICAL ENGINEER
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for the vehicle body industry.
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technical experience and initiative
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with appropriate increments, pension fund.
Application to Box P3723, care of " Plastics."
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ESTIMATOR for expanding well-established Laminated Plastics Fabricators. Good position, salary, pension. Keen man. Five days. Mosses and Mitchell Ltd., 60 Ironmonger Row, E.C.1. 237-37

FOREMAN for night shift wanted. Knowledge of maintaining machines preferred (injection moulding). Good wages to right applicant. Box P3115, care of " Plastics." 237-47

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WORKS MANAGER with 20 years' experience in compression and injection moulding, seeks similar position in Midlands or Southern England, preferably with a company of Trade Moulders. Box P3715, care of " Plastics." 237-x7661

WORKS MANAGER-PRODUCTION ENGINEER, returning shortly from overseas appointment, seeks senior position in plastics industry. Wide technical knowledge of plastics, especially p.v.c., and long practical experience in industrial management and engineering. Aged 39. Box P3717, care of " Plastics." 237-XA6970

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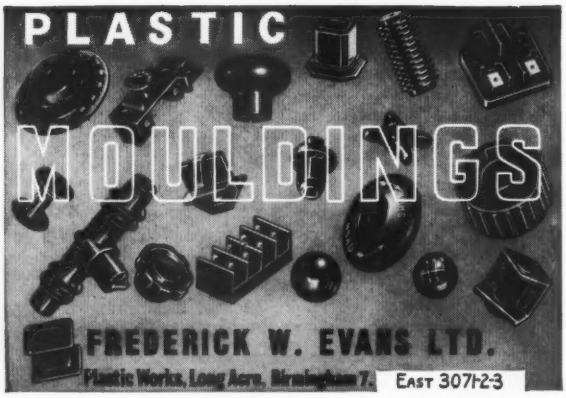

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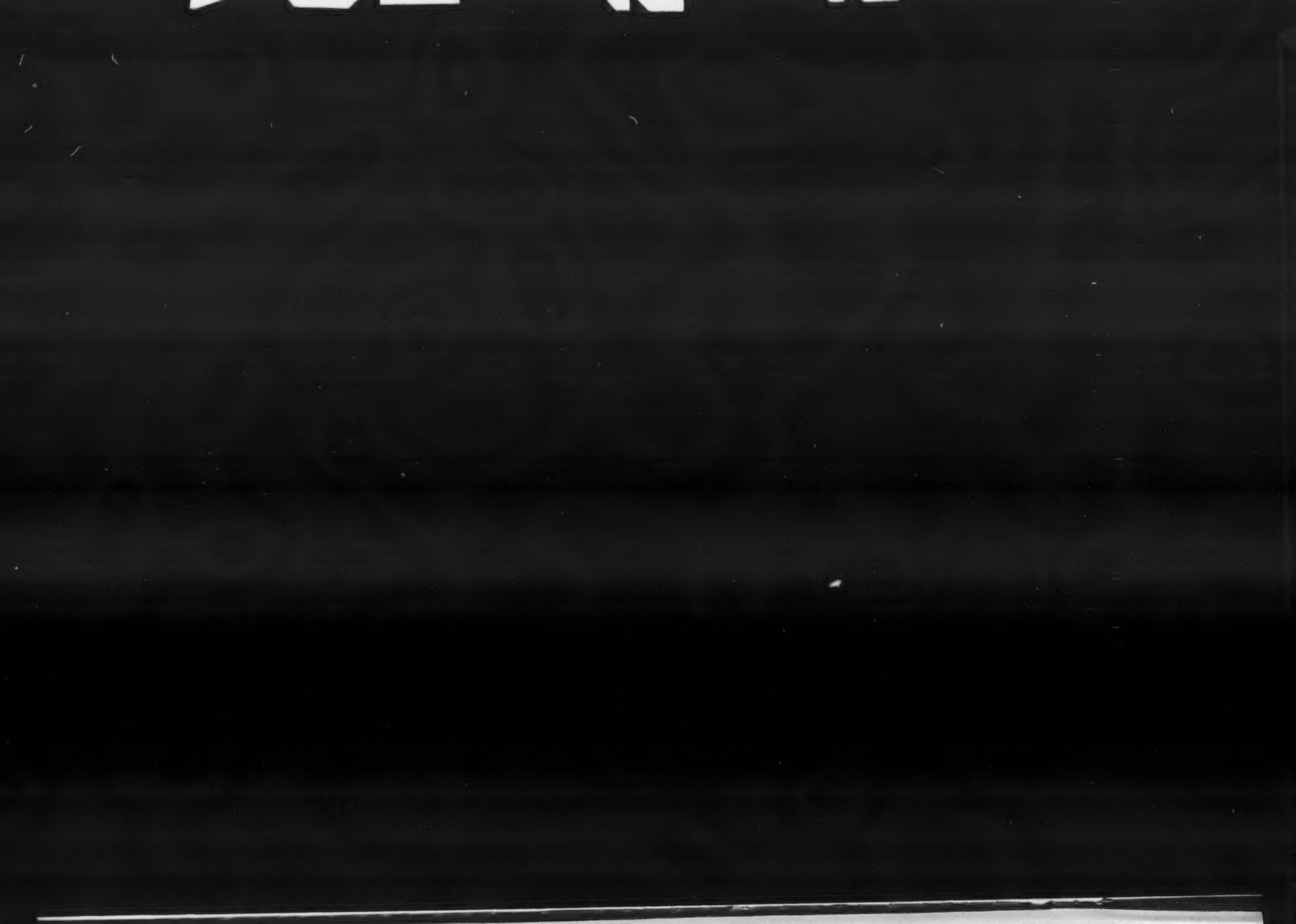
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